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Lead Paint Grinding Mills, Heath & Milligan Paint Works, Chicago. Lighting Conditions Typical of a Late Afternoon with Some Daylight Entering at Left. Mazda C Lamps near Ceiling Light the Mills and Spaces About Them so There Are No Dark Areas.

Improvement in Lighting of Paint and Varnish Works

Lighting Conditions in Need of Much Betterment—Why This is Especially Timely—Numerous Advantages of Good Lighting—Low Cost—A Few Suggestions for Improving the Lighting

By F. H. BERNHARD

This is the seventh of a series of twelve articles on improvement of lighting in as many industries. These articles emphasize the desirability of improving industrial lighting to meet present abnormal demands and those to come after the war. The advantages of better lighting are presented in a non-technical way so they may readily be brought to the attention of factory owners, managers and superintendents, very many of whom still have only an imperfect realization of the importance of good lighting to their industries.

EFFICIENCY in manufacturing depends upon the combined efficiency of a number of factors, chief of which are the processes and machinery used and the management and workmen employed. It is of little avail to use scientifically developed processes and highly perfected machinery if the personal factors, management and labor, are inefficient. An intelligent manager should realize that, in order to get the best possible results with the process and machinery at hand, he must see that the workmen use the proper methods and perform all operations with the highest possible efficiency. An essential to working efficiency, whether the work to be done is highly skilled or not, is favorable working conditions, which implies abundant light, ample ventilation, clean and orderly surroundings, cheerful and sanitary workrooms.

The foregoing statements are based on both logic and experience. One can find these ideas carried out

View in Stain Room of Heath & Milligan Paint Works at 4:45 P. M. Daylight in Foreground. Four 200-Watt Mazda C Lamps Replace About Forty 60-Watt Carbon Lamps.

in many of the most successful industrial plants where all features of plant equipment and operation have been studied and designed so that each contributes to the exceptionally high all-around efficiency of the entire establishment. The result is reduced manufacturing cost and greater profit, or improved quality and higher selling price at the same cost and therefore greater profit.

In the paint and varnish industry there are many establishments that are considered to be very successful, but there are very few that are operating at anywhere near the higher general efficiency that would be possible if more attention were given to some of the factors enumerated above, especially working conditions. It is the object of this article to point out how the latter can be improved through better lighting of the plant and how this, obtainable at small cost, also has other important benefits that should interest the plant owner.

Lighting Conditions in the Industry.

Before discussing the need for improved lighting, it will be desirable to state briefly the results of a survey of existing conditions in paint and varnish works. In the first place it must be stated that these are practically two distinct industries with little in common. Even where a company manufacures both paint and varnish, these are produced in entirely distinct departments with different buildings, equipment and radically different processes. Varnish works commonly have several one-story buildings where high ceilings and large windows can easily be provided. Paint works, on the other hand, nearly always employ a gravity process, which necessitates use of a three or four-story building.

In both kinds of plants it is common practice to work by day only and run very little, if any, overtime or nightwork; this is especially true of varnish works, which are seldom equipped with any artificial lighting whatever, except in the rooms where are located the varnish ageing and storage tanks, from which the finished varnish is drawn for shipment. Several reasons are assigned for the practice of operating by day only. One is said to be the inability to secure proper color mixtures, or "shading" as it is called, after dark; in some cases this is not even done on cloudy days but put off until a bright, sunny day reappears. Another reason given is the inability to get men for nightwork. Still another is that the industry does not require nightwork or overtime because there can be accumulated considerable stocks of goods ready for shipment so that the fluctuations in sales do not materially affect the manufacturing departments.

On account of this practice or custom of operating by day only, one finds more or less successful efforts to make the daylight conditions as good as possible by providing liberal window surface and occasionally skylights. It is the exception, however, to find the glass panes clean, which neutralizes much of the efficiency of the windows. The value of good reflecting surfaces is frequently recognized by painting white or calcimining the ceilings, walls and columns, which aids considerably in improving the distribution of the daylight and such artificial light as is provided. In paint works where the ceilings are low or the floor widths great, and especially in the rooms where the grinding and mixing mills reach close to the ceiling, daylight conditions are far from satisfactory.

It is therefore customary in practically all paint works to provide some artificial lighting, this being used throughout the working day in those parts of the plant where the daylight is inadequate. As a rule, this artificial lighting is poorly laid out, of obsolete type, and therefore both ineffective and inefficient. Usually the idea seems to have been that it is merely supplementary to the natural light and may be of makeshift character. The fact is that it is exceptional to find a paint works in which both the natural and artificial lighting are efficiently designed and maintained. and, as already stated, in varnish works frequently there is no attempt at artificial lighting of any kind.

No one can find fault with the plan of utilizing daylight to the utmost. It is true conservation and

was never more necessary than in these times when every natural resource must be utilized to the best advantage. Doubtless daylight conditions can in many cases be improved by keeping windows more clean, by removing objects that obstruct the path of daylight to the interior of large rooms, and by keeping ceilings, walls, columns and the surfaces of certain machines as white and clean as possible to enhance reflection.

Making daylight conditions as reasonably perfect as possible is not only desirable but necessary. But it does not suffice, because daylight is so variable; hence reasonably perfect artificial light must also be provided. Failure to do this is shortsightedness, neglect of the manufacturer's own interest to make his production independent of weather and season, and neglect of his employes' interests to protect them from eye strain and promote their welfare and contentment.

In the first place, cloudiness and storms seriously reduce the intensity of daylight so that at distances only 15 to 20 feet away from the windows the light on cloudy days is often very much reduced and spaces around grinding mills or other machinery are practically in gloom, impairing work and inviting accidents. With the shortened days now steadily approaching the last hour or more of regular work will gradually turn from twilight to utter darkness and after October 27 we will suddenly lose on hour when the summer daylight-saving schedule is changed back to normal standard time. Even the early morning hour will presently be too dark for effective work without eye strain. If provision for good artificial lighting has not been made, only two alternatives may be expected. One is the actual shortening of the work day to 8 or 7½ hours. Another is maintaining the present working schedule but being content to have the workman practically waste from one-half hour to over an hour in the early morning and late afternoon, besides indefinite hours on cloudy and stormy days. If at any time waste of labor was excusable, the present time, when all labor must be conserved, is not.

At small cost a good lighting system eliminates these losses from failure of daylight and makes it possible to derive other marked advantages. The first of these is that it puts the plant in condition to work overtime, or even with double shifts nearly all night, in order to handle an exceptional rush of business or heavy orders continued over a long time. Countless plants in a great variety of industries are doing this to carry out Government or other war orders promptly and without heavy investment in new buildings and additional machinery. The paint and varnish industry has seldom been required to operate overtime or with double shifts. There is no telling, however, exactly what the future has in store. Most business men look for a great impetus to business in general on the return of peace and resumption of normal conditions. In all likelihood there will be a marked revival of building, which has already been below normal for about a year. This will call for large stocks of paints and varnishes. Enlargement of plants will be prohibitive in cost and delay compared with adapting present plants for efficient overtime or nightwork to handle the increased demands.

Clearly the provision of good artificial lighting along with reinforcing the deficiencies of daylight during normal working hours and bringing other advantages to be mentioned below, is in the nature of preparedness for the big business of the future. Preparedness, we should have learned by this time, should be timely in order to save costly delays.

Packing Room in Heath & Milligan Works at About 5 P. M. with a Little Daylight from the Left. Three 500-Watt Mazda C Lamps in Opal Inclosing Globes Provide Abundant Light in Place of the Many Carbon Lamps Formerly Used.

The common statement of varnish and paint manufacturers that their work cannot be done properly under artificial light is doubtless based on experiences prior to 5 or 10 years ago. During these years the lighting art has made very rapid advances, however. Incandescent lamps have been improved so that they are 3 to 5 or 6 times as efficient as the old carbon lamps, depending on size. They give color values much closer to daylight than formerly and special lamps have been developed that reproduce daylight colors as perfectly as may be necessary in practice. Other lighting equipment has also been improved, notably reflectors for efficient direction of the light, diffusing means to minimize glare, vaporproof fixtures, etc. The fact is that modern lamps and lighting equipment permit artificial light to be obtained more economically and effectively than ever, so that it is more indispensable than it ever was before.

Important Advantages of a Good Lighting System.

Experience has shown that installation of a lighting system incorporating modern scientific ideas of industrial illumination permits maintaining at all times the production rate secured under daylight, and in some cases even to exceed it. This is because a well designed system will give a much more uniform light distribution and more constant intensity than is usually available by daylight with its changes according to the time of day, state of weather and season. A good system will brighten all dark parts of the plant that are usually not penetrated by daylight, it will improve visual conditions so that the workers will see their work without eye strain, it will reduce loafing in obscure corners of the works and in general it will improve the all-around efficiency of the men so that they will unconsciously speed up their work. It has been found in various industries that an increase of output of 2 to 25 or more per cent follows the provision of a lighting system that furnishes adequate and suitable illumination.

Just how much speeding up will result in a paint works is not easy to say, but 10 per cent is doubtless a conservative figure. In one of the plants visited the assistant superintendent had noted a very marked improvement in the alertness and general efficiency of the men after the lighting had been modernized. In this case the modernizing of the lighting meant not only increasing the illumination intensity and making the light distribution more uniform, but this was secured at one-third the operating cost of the original lighting system. The latter had included about 40 of the old 60-watt carbon lamps which were replaced by 4 200-watt Mazda lamps in enameled steel reflectors mounted close to the ceiling.

Spoilage in any industry is always a heavy loss and manufacturers do their utmost to minimize it. In making paints and varnish the important steps in the process, like weighing or measuring out the ingredients and adding the right amount of color, thinner or drier at the right time, are usually performed by the more experienced men, but where these are handicapped by inadequate light mistakes are very likely to happen. Many a spoiled batch of paint is due to this cause, even where some other reason may at first seem more plausible. With increase in the number of new or only partly trained men, the possibilities for spoilage at one or another step in the process are increased. While an experienced hand may be able to get along with less light, an inexperienced worker needs a great abundance on this account alone, as well as to avoid the danger of incurring accidents.

Industrial accidents have marred the record of splendid industrial development in this country. They constitute a heavy drain on both employers and employes which for the most part is entirely unnecessary because so many of the accidents are preventable. Light is an important agent in accident prevention. It exposes dangers that lurk in the dark. The hazards of gears, oil-soaked, slippery floors, obstructions in aisles or passageways, tortuous stairways, etc., are serious when a workman cannot see them, but with

Night View in Labeling Room, Paint Department of Sears, Roebuck & Company, Chicago. Mazda C Lamps in Porcelain Enameled Steel Bowl Reflectors Furnish Well Distributed and Practically Glarefree Illumination.

Night View in Filling Room, Sears-Roebuck Paint Department. Mazda C Lamps in Vaporproof Fixtures Well Distributed About Room.

well distributed light these dangers can be observed in time to avoid bad accidents.

Accident insurance specialists and safety experts are agreed that a large percentage of industrial accidents are undoubtedly caused by poor lighting. An investigation undertaken before the war by a large liability insurance company showed that out of a total of about 91,000 accidents reported to it that year, each of which was analyzed as to cause, nearly 24 per cent were due to poor lighting. Similar conclusions were reached in factory investigations undertaken for the British Government; of one class of accidents—falls on stairways—it was shown that about 71 per cent were caused by inadequate light.

Because of these facts, in our more progressive industrial states factory inspection has been extended to include supervision over the lighting and the authorities empowered to insist that both natural and artificial lighting shall be adequate. New Jersey, Pennsylvania and Wisconsin have definite factory lighting codes; New York and Ohio are drafting similar ones, and doubtless other states will do this also. There is no credit to a manufacturer waiting till he is legally compelled to better his factory lighting conditions when it is clearly to his own interest to take the initiative so as to obtain its numerous advantages as early as possible.

Besides those already mentioned, these advantages include reduction in eye strain and improvement in health of the employes. Wherever a workman has to work steadily under inadequate or improper light, eye strain and visual fatigue are bound to ensue which impair his efficiency. More important, in a paint factory at least, is the impairment of his health when meagerness of light promotes inattention to cleanliness and sanitary conditions. Lead poisoning is a not uncommon malady among the employes of paint works, especially dry-color works. Scrupulous attention to cleanliness minimizes the danger of contracting it. A well lighted plant is one that is likely to be kept clean because accumulations of dust, dirt and rubbish are not so readily overlooked. Toilets, washrooms and lunchrooms also will be kept in more sanitary condition when properly lighted.

Another most important advantage of good lighting is that it makes much more cheerful workrooms and thereby makes for contentment among the workers. By contrast, dark and gloomy rooms are depressing. This and similar psychological influences of good lighting cannot be overlooked at a time when labor shortage is acute and men change their places of employment for little cause and at short notice. The abrupt "I quit" is the despair of plant superintendents and foremen just now more than ever. Excessive labor turnover can be reduced, however, by making working conditions reasonably agreeable. Good lighting has been found to help materially in this direction in all industries and the actual experience in several paint works shows that the men are thereby made more contented and also more efficient.

Good Lightinr Obtainable at Low Cost.

For the benefit of those varnish or paint producers who have provided no artificial lighting, or only meager lighting, because of assumed extravagant cost, it may be said that their opinion is entirely without foundation. Electric lighting with modern lamps is extremely economical. No general statement of what it costs can be made without knowledge of the actual conditions in the plant considered. However, the intensity of illumination need not be as high as in a shop where exacting machine or hand work is done. Very seldom need the power consumption for lighting exceed one watt per square foot of floor surface; more commonly with bright walls, columns and ceilings the power required would be considerably less, and under especially favorable conditions only about ½ watt per sq. ft. Assuming, however, a consumption of 1 watt

Another Night View in a Paint Grinding Mill Using Vaporproof Fixtures. Illumination Is Actually Much Better Than Photograph Shows, Though Reflectors Over the Fixtures Would Reduce the Glare and Improve the Efficiency.

per sq. ft. and an energy cost of 10 cents (which is exceptionally high for factory lighting) per kilowatt-hour, we find an operating cost of 1 cent per hour per 100 sq. ft. This works out so that the total average lighting cost per day amounts to only a small percentage of the daily labor cost.

Common Mistakes in Plant Lighting and Their Remedies.

The most common artificial lighting one finds in paint works consists of a multitude of bare carbon incandescent lamps promiscuously arranged wherever it was thought necessary to provide some light and each almost invariably hung from a drop cord. This kind of lighting is a relic of the old days when these lamps formed the only practical light source available, arc lamps being too large for the size of room usually found in these plants; development of reflectors and other lighting accessories had not been carried far. These developments were accelerated about a dozen years ago and since then have been quite rapid. Knowledge of illumination from the scientific standpoint has made wonderful strides and the requirements of satisfactory industrial lighting are now well known.

As an outcome of this research and development work it is now definitely known that the old kind of lighting is wasteful and positively injurious for a number of reasons. It is wasteful of electric current because the old lamps are much less efficient than the incandescent lamps now available, and wasteful of light because absence of reflectors causes too much of the light to be needlessly dissipated to walls and ceilings; moreover, the bare lamps are injurious because the light from the brilliant filament strikes the eye direct without diffusion, producing annoying glare.

Exigencies of the war are in one way solving the problem and in another way extending and aggravating it. By official order, the carbon-filament lamps will practically be no longer manufactured on account of their inefficiency running counter to urgent fuel conservation; this will diminish the waste. But where the old lamps are replaced by tungsten lamps of equal size the glare will be greatly increased, first, because they give three or more times as much total light, and, second, because the filament itself is more brilliant and gives more light per unit area. Consequently, the use of the tungsten lamp makes it more imperative to shield the filament from direct view or else diffuse the light coming from it directly by using a frosted bulb or an opal glass diffusing globe, bowl or cup.

Fortunately, by using a suitable reflector, it is possible to cut off the direct horizontal light from the lamp, thus reducing glare, and at the same time cut off the light that is wasted in upward directions from a bare lamp, thus improving the over-all efficiency of the unit. Such a reflector should be of a shape to throw the light down and obliquely sideways so as to light the working space over a considerable area, also throwing some light on the vertical sides of mills, tanks, piles of filled cans, etc. The best shapes are the deep bowl and the new dome, the latter being preferable because of its wider distribution.

The size of the reflector must correspond with the size and type of lamp used, since the center of the filament must be at what may roughly be called the "focus" of the reflector in order to give the light distribution guaranteed by the reflector maker. Some reflectors are obtainable that are adjustable for several sizes of lamps; this adjustment should be carefully made. Several types of good reflectors are on the market. For paint and varnish works porcelain-enameled steel reflectors are probably best suited for all-around service; they are durable, easily cleaned and of high efficiency. Glass reflectors of prismatic or mirrored type are also available where they can be mounted high so as to be unexposed to breakage; with care they can be readily cleaned; their efficiency is very high.

As high mounting of lighting units as possible is practically always desirable. It gives the widest light distribution and reduces the deep shadows found where localized lighting from low-hung lamps is used exclusively. It removes the light sources from the immediate field of vision and thereby reduces glare. It eliminates the many troubles from drop cords such as broken lamps and sockets, missing lamps, short-circuits and grounds, and continually untidy condition. It also permits use of fewer and larger, therefore more efficient, lamps and cuts down wiring and first installation as well as operating and upkeep costs.

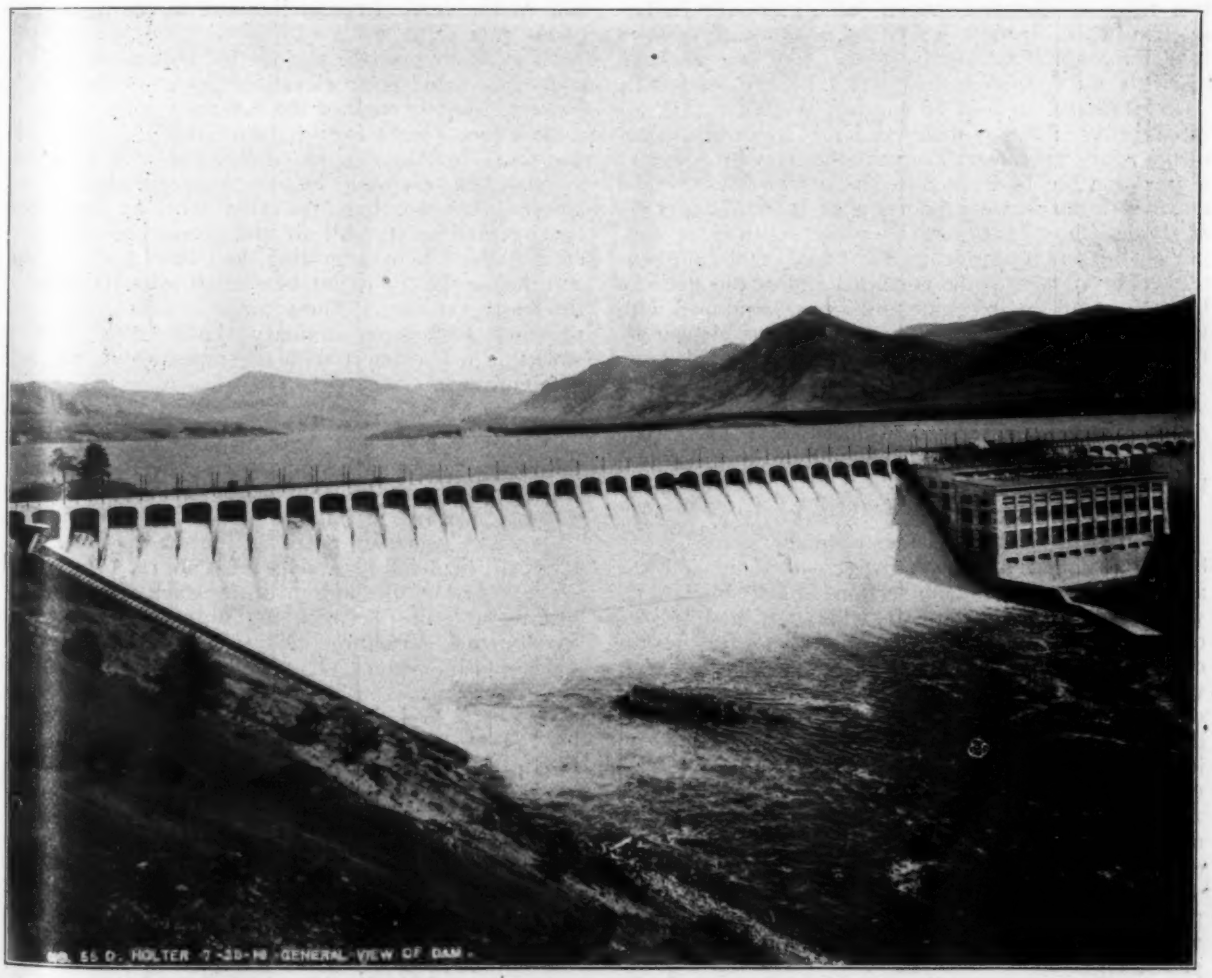
New Hydroelectric Plant of Montana Power Company

Holter Project, Recently Completed, Adds 48,000 KV-A. to Company's System—Details of Hydraulic Equipment

By W. A. SCOTT

THE Holter power project, recently completed, stands as the latest hydroelectric development of Montana Power Co. The new plant, which was placed in operation in July, enables the company to throw 48,000 kv-a. of new energy into its vast interconnected system in Montana, and it is understood the demands are such that this additional production of power will all be absorbed within the next 6 to 12 months. The Holter Station is among the largest of the company's 12 hydroelectric plants. Seven of these are on the Missouri River, proper; there are two on the Madison, one on the Big Hole and one on the Yellowstone, those streams being tributaries of the Missouri. The station at Thompson Falls, among the newer plants of the system, is on Clark's Fork, a branch of the Columbia River system. It will be seen, then, that in the production of power there is a utilization of streams on both sides of the Continental Divide.

The transmission and distribution lines carry electric power to all classes of industries, for public utilities and for domestic uses to a constantly increasing extent. Among all these there is a steadily maintained consumption of energy, accompanied by some heavy increases in demands. The mining and metallurgical industries of this section stand first as power consumers, and the electrified railroads second. In connection with metal mining, the requirements for electric energy are likely to increase, rather than diminish, as the future outlook does not indicate a lighter demand for the metals produced. As regards the railroads, the facts available show such efficiency and



New Holter Hydroelectric Plant of Montana Power Co.

economy in operating by electric power that the further electrification of lines, especially in a region of great hydroelectric possibilities, would seem to be inevitable; and this tendency is accentuated by the great necessity for fuel conservation on a national scale. Then, within the territory served, the consumption of energy for domestic appliances is very high, as based on population. The fact that electric energy is everywhere available and takes the place of domestic help, which is not available, has led to the constant increase of this load, which is a desirable one. The bringing in of the new Holter generating station, therefore, is opportune to meet additional demands for power.

The Holter Development.

The site of the Holter hydroelectric plant is on the Missouri river, about 40 miles north of Helena, and 4 miles from Wolf Creek station on the Great Northern Railroad. A private railroad was built from that station to the plant to serve during and after the period of construction. The concrete dam, gravity type, has a length of 1364 ft. This includes ogee spillway, intake and abutment sections. The southwest abutment is 400 ft. long, that on the northeast having a length of 91 ft. The spillway section, with 14-ft. flashboards, has a net spillway length of 558 ft., and is designed for a flood flow of 90,000 cu. ft. per second over the crest, with headwater at elevation 3562. The base width of spillway, not including apron, is 180 ft. The apron construction is 76 ft. long, having two rows of diamond-shaped baffle piers, 17 ft. between rows, with piers spaced 16 ft. on centers. The top of the apron is flush with the river bed, and the height of the dam from that level to the crest is 104 ft.

The intake section, of concrete, gravity type, located between the spillway and the southwest abutment, forms an integral part of the dam proper, and also forms the back wall of the power house. The entire dam structure supports a 14-ft. roadway 1364 ft. in length. That part over the spillway is supported by 4-ft. concrete piers, spaced 22 ft. on centers. The 10 bays at the northeast end of the spillway have 14 by 18-ft. drop gates of timber, equipped with two screw stems working in sleeve nuts driven by bevel gearing. The gate hoists are operated by a 50-hp. motor, the power being transmitted from a line shaft through friction clutches. The 21 other bays of spillway have semi-permanent flashboards, 14 ft. high and 18 wide, that can be released by knocking out pins.

Waste Gates.

There are six 5-ft. diameter sluices, spaced 16 ft. 8 ins. on centers, at the southwest end of the spillway and adjacent to the intake section. Each sluice has a wooden emergency gate, 8 ft. wide, 7 ft. high, placed on the upstream face of the dam; and for normal operating there is a 60-in. diameter inside screw gate valve located 25 ft. from the upstream face of the dam, and in a tunnel 8 ft. wide by 11½ high inside the dam. The tunnel is connected with the top of the intake section by a shaft 8 ft. long and 4½ wide. At the discharge end of each sluice is a cast iron nozzle, 15 ft. 3 ins. long, with a 5-ft. diameter inlet and an outlet 10 ft. wide by 2 high on the down-stream face of the dam. The center line of sluices is at elevation 3478; the discharge capacity of one sluice with the pond at elevation 3562 is 1160 cu. ft. per second, the total discharge of the six sluices being 6960 cu. ft. per second.

The wooden gates for the four main-unit penstocks have double-screw stems; those for the exciter units have single-screw stems. The screw stems work in sleeve nuts, driven by bevel gearing. The hoists for this equipment are operated by a 50-hp. motor through friction clutches on a line shaft. Stop-log grooves are provided at all gate openings through the intake section.

Penstocks.

Each main unit opening through the intake leads into a riveted steel penstock, 14 ft. diameter, 124 long, with tapered section 19 ft. 8 ins. long connecting with the scroll case of the turbine. The inlet to the scroll case is 2 ft. 6 ins. diameter. The main unit penstocks are made of 47 ft. 11 ins. of ½-in. steel plate, 30 ft. 4 ins. of ⅝-in. and 45 ft. 9 ins. of 11/16-in. plate. The two exciter-unit penstocks are each 132 ft. 3 ins. in length, 5-ft. diameter, and made up of 71 ft. 5 ins. of 5/16-in. plate, and 60 ft. 10 ins. of ⅜-in. plate. The maximum velocity in the main unit penstocks is 10.3 ft. per second, with wheels developing 16,450 hp., under 109-ft. head, and a water consumption of 1585 cu. ft. per second. Exciter penstock velocity is 3.6 ft. per second, with wheels developing 730 hp. under 109-ft. head, and a water consumption of 71 cu. ft. per second. The main unit penstock rings are 7 ft. 7 ins. in length and made up of three plates, with adjacent rings staggered, so that longitudinal joints come 2 ft. apart. Exciter penstock rings are about 7 ft. 3 ins. long and made up of one plate with longitudinal seams of adjacent rings staggered 45° each side of the vertical center line and in the upper half of the pipe.

The center line of openings for both main and exciter unit gates is at elevation 3537. Embedded in concrete directly back of the gates are 36-in. diameter air and access pipes for the main units, and 24-in. similar pipes for the exciter units. The filler gates for the penstocks discharge into these air and access pipes. These gates are hand-operated with a screw-stem bevel-geared hoist. All air and access pipes are covered at the top by a grating, and have a 14-in. pipe 2 ft. below the top of intake section, with its outlet at the upstream face. These air and access pipes are provided with 6-in. auxiliary vents, from the penstocks, which connect with the pipes above the filler gate entrance.

Racks.

Overhanging racks, built in sections, in front of the intake section, are supported by steel rack frames resting upon 36-in. built-up cantilever beams embedded in the concrete of intake structure, and are also fastened to the pier noses at the front. The main racks are inclined at a slope of 1 to 12. Horizontal sections are at the bottom of the rack structure and rest upon beams between the supporting cantilevers for the rack structure. All rack bars are 4 ins. by 5/16 on 3-in. centers The length of rack section, 166 ft.; maximum water depth, 40 ft.; minimum depth, 26 ft. The gross maximum pond level, 8160 sq. ft.; net, 7310 sq. ft.; gross minimum pond level, 5700 sq. ft., net, 5100 sq. ft.

The rated full load velocity with maximum pond level, 0.89 ft. per second; net full load velocity with minimum pond level, 1.18 ft. per second. Main unit wheels for maximum pond taken at 16,450 hp., 109-ft. head, using 1585 cu. ft. per second. Exciter unit wheels for maximum pond taken at 730 hp., 109-ft. head, using 71 cu. ft. per second. Main unit wheels for minimum pond, taken at 13,500 hp., 95-ft. head, using 1475 cu. ft. per second. Exciter unit wheels for

minimum pond, taken at 600 hp., 95-ft. head, using 66 cu. ft. per second.

The exciter penstock screens, placed in stop-log grooves in front of the penstock gates, are made of galvanized wire screening, of ½-in. mesh No. 8, B. & S. wire, stretched on three steel frames to each penstock. The gross area of each frame is 94.5 sq. ft.

A 10-in. supply line for camp irrigating is carried through the southwest concrete abutment. This supply is controlled by a 10-in. gate valve on the upstream face of the abutment, and is protected by a screen.

The fishway, constructed at the northeast abutment, runs parallel to the splash wall, water being admitted through eight 18-in. diameter steel pipes running through the abutment wall. These pipes are spaced 7-ft. 4-in. centers, with center lines set at eight different elevations. Wooden gates are placed at the upstream end of steel pipes for controlling the water to the fishway. These are hand operated. The fishway is 6 ft. high, 8 wide, with baffles spaced 2 ft. on centers.

Power House.

The power house, constructed of steel frame, with walls, floors and roof of concrete, has a length of 208 ft. along the intake structure; a width of 81 ft., and a height of 64 ft. above the first floor. There is a height of 11 ft. between the basement floor and the first floor. The floor space afforded is 26,880 sq. ft., not including basement floor. The power-plant building rests upon a solid concrete foundation that extends to bedrock.

The building is equipped with an electric crane of 75-tons capacity, with a 5-ton auxiliary hoist. This is a 4-motor, cage-operated, traveling crane, furnished by the Cleveland Crane & Engineering Co. The speed of operations is as follows: Main hoist, 6½ ft. per minute; auxiliary hoist, 30 ft. per minute; bridge travel, 75 ft.; trolley speed, 40 ft. The span is 40 ft., with sufficient height for a lift of 50 ft. The motor capacities are: Main hoist motor, 52 hp.; auxiliary hoist, 15 hp.; bridge travel motor, 37 hp.; trolley motor, 22 hp. The building required 400 tons of steel, supplied by the American Bridge Co.

Hydraulic Installations.

The four main-unit water wheels are the S. Morgan Smith Co. design, each rated at 13,500 hp., 150 r. p. m., operating under a gross head of 95 ft. The scroll cases are of ⅝-in. plate steel at large end and of 7/16-in. plate at small end of scroll. The inlet to scroll case is 12-ft. diameter. The wheels are the single-runner, Francis type, with vertical shafts and 95-in. diameter cast steel runners, with a runaway speed of 255 r. p. m. The discharge of each turbine is 1475 second ft. under a 95-ft. head, and 1585 second ft. under a 109-ft. head. The cast steel wicket gates are provided with cast iron links, bronze bushed. These links are designed to be the weakest parts of the gate mechanism; one will break when a gate be-

General View of Generator Floor—Holter Plant, Montana Power Co.

comes clogged, thus allowing the other gate to close. The weight of the turbine shaft, runner, downward-thrust runner and generator rotor is carried on a Kingsbury thrust bearing placed at the top of the generator. Each unit has a platform inside the pit liner, 4 ft. 3 ins. above the basement floor, to give access to the generator and to steady the bearings, air brakes and governor drive.

The two exciter unit turbines consist of the S. Morgan Smith Co. make, each rated at 600 hp., 450 revolutions under 95-ft. gross head, and direct-connected to the generator. Each unit has a cast-iron scroll case with a 30-in. inlet; a 30-in. diameter runner, with wicket gate. This is the Swain type of single-runner turbine, with vertical shaft, having a runaway speed of 855 r. p. m.

The draft tubes for main turbine units, of cast-iron and concrete, have a throat diameter of 9 ft. 7 ins., and outlet dimensions of 17 by 29 ft., with circular ends of 8½-ft. radius. Along the center line there is a cast-iron section 6 ft. 7½ ins. long, and a concrete section 22 ft. 7½ ins. long, giving a total draft tube length of 29 ft. 3 ins. The velocity at throat is 20.5 ft. per second under a 95-ft. head and a volume of 1475 cu. ft. per second; the velocity at outlet is 3.42 ft. per second under same head and volume. Under 109-ft. head, and a volume of 1585 cu. ft. per second, the velocities at throat and outlet, respectively, are 22 and 3.68 ft. per second.

Data on draft tubes for exciter unit turbines are: Throat diameter, 2 ft. 2⅛ ins.; outlet diameter, 5½ ft.; length of cast-iron section, 5 ft. 5¾ ins.; concrete section, 18 ft. 2⅜ ins., giving a total length of 23 ft. 8⅛ ins.

The governors embody the central, open, oil-pressure system, with double-supply mains and single-drain mains. The system operates at about 200 lb. per sq. in. pressure, the oil being supplied to the governors by two motor-driven, rotary oil pumps equipped with unloading valves. The two governor oil pumps, made by the Lombard Governor Co., have a capacity of 150 g. p. m. and operate against a pressure of 200 lb. per sq. in., each pump being connected by silent-chain transmission to a 25-hp. motor. An air and oil pressure tank, set near each unit, is connected to the governor air main in the basement. Air is supplied at 200 lb. pressure by a 6 by 3 by 7-in. tandem, compound, motor-driven compressor made by Hall Steam Pump Co. Between the air mains and compressor is an air-storage tank, 3 ft. 9 ins. diameter by 9 ft. high. The main unit actuators are the S. Morgan Smith type of oil-pressure relay valve design. The governors have remote control, load-limiting devices, tachometer, gate opening indicator and auxiliary hand pump for governing by hand control; also safety devices to shut down the unit in case governor drive should break.

(To be continued.)

LECTURE ON PROTECTIVE LIGHTING.

The third of a series of popular lectures prepared under the auspices of the Committee on Popular Lectures of the Illuminating Engineering Society is now ready for presentation. It is entitled, "Protective Lighting," and treats of the use of light as a means of defense against damage to the industrial and military machinery of the country, resulting from sabotage and acts of the enemy agents in general.

CONTROL SYSTEM FOR CEMENT-MILL MOTORS.

Details of Installation at Plant of Lawrence Portland Cement Co.

By William H. Easton

An interesting system for controlling groups of large, high voltage motors has been recently installed at the Lawrence Portland Cement Co., Siegfried, Pa.

There are several groups controlled by this system in the mill, but the one shown in Fig. 1 is typical. This group consists of eleven motors—nine 150-hp., 2200-volt Westinghouse squirrel-cage motors, driving 5½ by 22-ft. tube mills, and two 250-hp., 2200-volt Westinghouse vertical squirrel-cage motors (cement mill type), driving Bradley grinders. The control for this group is illustrated in Fig. 2 and possesses the following features:

All the motors are controlled from a single point.

As much of the starting apparatus as possible is used by all the motors in common, thus reducing the first cost.

Any desired number of motors can be shut down from the mill's substation.

Thorough protection to machinery and workmen is provided.

The Control.

The motors occupy a long and narrow space in front of the grinders, and the control is located on a gallery above them. The operator on the gallery, therefore, has all the motors under his observation.

The control consists essentially of a circuit breaker and a double-throw oil switch for each motor, and a starting equipment consisting of a circuit-breaker, an oil-immerced magnetically-operated contactor, and two

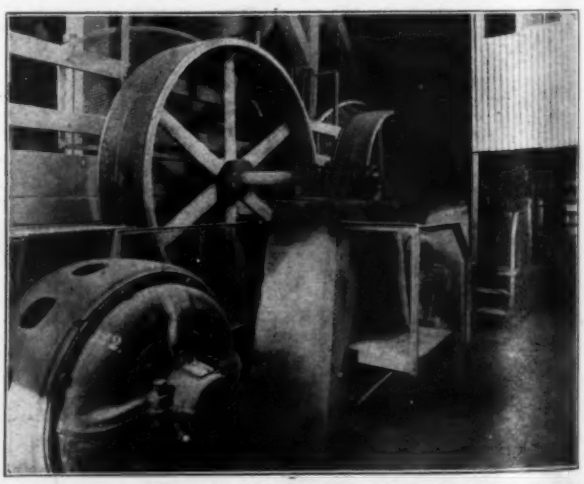


Fig. 1.—Nine 150-h.p., 2200-volt Westinghouse Squirrel-cage Motors, Driving 5½ by 22-foot Tube Mills and Grinders.

auto-starters for the use of all of the motors. The oil switch has two positions, one for starting the motor and the other for normal running. The purpose of the contactor is to provide a means for connecting each motor in turn to the starting circuit-breaker and the auto-starters.

In starting a motor, its own circuit-breaker and the starting circuit breaker are both closed, and the oil switch, which was previously in the off-position, is

thrown to the starting position. There is an auxiliary contact on the oil switch which energizes the magnet switches of the contactor and these likewise close. A

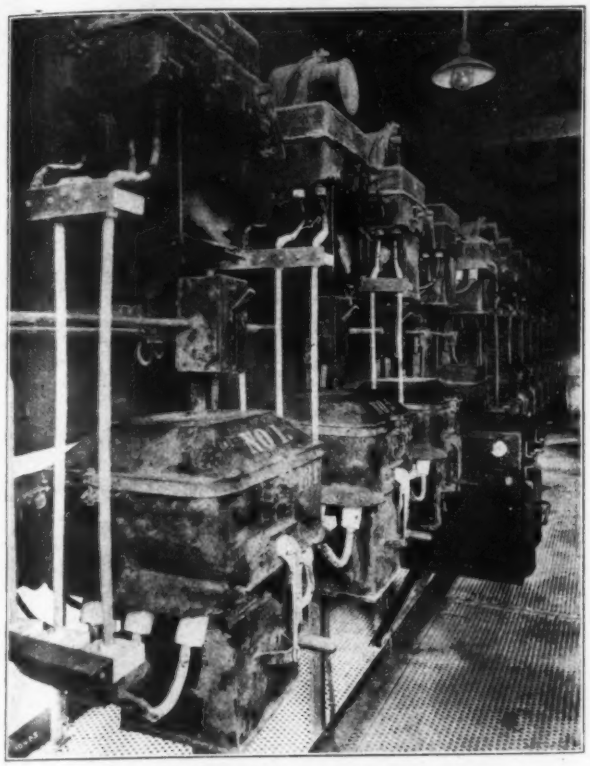


Fig. 2.—Controller for Grinder Motors.

The upper row consists of the circuit breakers for each motor; the lower row consists of the oil starting switches. The large square tank carries the contactor used by all of the motors.

circuit is now formed through the starting circuit breaker, the contactor, the atuo-transformers, and the oil switch to the motor, which starts on reduced voltage. The starting circuit breaker provides full protection during the starting period and, being set for heavy currents, remains closed under currents that would open a circuit-breaker set for normal running conditions.

When the motor comes up to speed, the oil switch is moved to the running position. The auxiliary contact opens before the main contacts, thereby opening the contactor, which therefore opens the circuit to the motor and also disconnects the auto-transformers from the line. When the oil switch is closed in the running position, the motor is connected directly to the line through its circuit-breaker and oil switch.

The oil switch never opens a circuit, since the contactor does so on the starting side, and the motor's circuit-breaker is used to stop the motor. Each motor is, of course, started separately.

The circuit breakers provide both over-load and no-voltage protection. The no-voltage release trip is normally held closed by a magnet coil energized by a secondary 220-volt circuit, and when the power fails the breaker is, of course, tripped. This mechanism is also used to provide a safety stop. A push button is connected in series with each tripping coil and located near the corresponding grinder. (One can be seen on the extreme left-hand post in Fig. 1.) When one of these buttons is pressed, it breaks the circuit of its tripping coil, opening the breaker and stopping the motor.

There is also a third use to which this tripping mechanism is put. The Lawrence company purchases power from the Lehigh Navigation Electric Co. on a maximum demand rate. That is, the cement company is permitted to use a definite maximum kilowattage for a specified length of time; if either this time limit or the maximum kilowattage is exceeded, a higher rate must be paid. Hence it is desirable to make some arrangement whereby the power consumption can be reduced when the specified limits are reached. This is accomplished in the following manner:

A second 220-volt line runs from the substation of the mill along the control panel, and to it the no-voltage release coils of the circuit breakers can be connected in series by means of switches, which can be seen just below the circuit breakers in Fig. 2. When these switch handles point upwards, the release coils are independent of the substation line; when they point downwards, they are connected to it. By opening a switch in the substation the circuit breakers connected to the secondary line are tripped and their motors stopped. Under normal operation several of the motors are arranged for control in this manner, the number depending upon conditions. From this central location the power consumption of the mill is carefully watched and when, because of extra heavy work in some part of the plant, the critical point is reached, the selected grinders are stopped temporarily and the power consumption reduced, thus avoiding the payment of a higher rate. When the power consumption falls again, the operator in the grinder room is instructed by telephone to start up the idle motors again. This tripping system is now being manually operated, but arrangements are being made to operate it automatically by means of a maximum demand meter and a set of relays.

Other Precautions.

A wattmeter mounted on top of each circuit-breaker indicates the amount of power being taken by each motor and shows clearly to the attendant the

Fig. 3.—Auto-transformers Used in Starting all of the Motors.

operating condition of the grinder. Any irregularities, such as a grounded phase or a tight bearing, are immediately evident, so that breakdowns can be forestalled and the motor and grinder kept at the highest point of efficiency.

All of this equipment is of Westinghouse make.

Foundation Construction for New Station at Kansas City

Many Interesting Problems Encountered in Work for 150,000-Kilowatt Northeast Plant on Missouri River

FOUNDATIONS have been practically completed for the first units of a 150,000-kw. power plant being built for the Kansas City Light & Power Company, from designs of Sargent & Lundy, by The Foundation Company, of New York City. The units to be installed this year, at a cost of more than five million dollars, will provide for 50,000-kw.

The most important substructures are those through which the condensing water passes to and from the plant. They consist of the intake tunnel, intake well, condenser well, discharge well and discharge tunnel. The largest of these are the condenser and intake wells, each of which is 70 feet in diameter and 61 feet deep.

Fig. 1.—Starting Foundation for Intake Well.

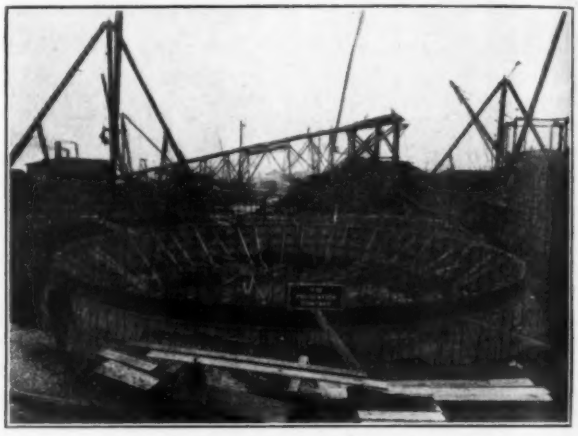


Fig. 2.—Reinforcing Steel in Place—Intake Well.

Fig. 3.—Second Set of Forms Being Placed.

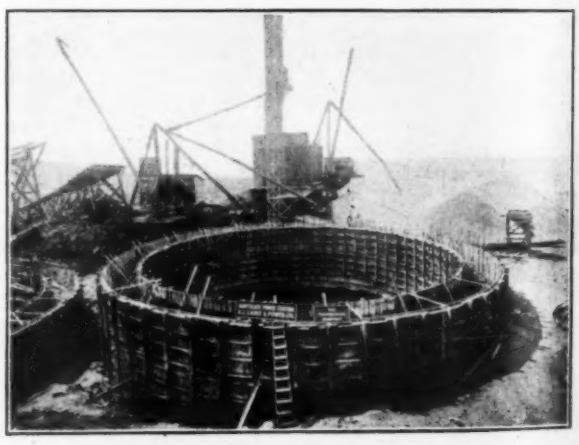


Fig. 4.—Pouring Concrete Walls for Intake Well.

The site on which the plant is located is composed largely of made ground for the first 10 or 15 feet, the material consisting of silt, light loam and small quantities of various decomposed vegetable matters. Below this there is fine sand for a depth of 20 feet, then the material becomes almost coarse enough to be called "fine gravel," and is capable of carrying the allowable load of six tons per square foot.

Under normal conditions this would be easy ground in which to sink caissons, but in this case many large tree-trunks were encountered in the fine sand, and in one place, 25 feet below the surface, a piece of 14-in. cast-iron pipe was found.

Under similar subsoil conditions, wells of this size are sunk in the following manner:

A circular pit about 8 feet deep is excavated with clamshell buckets handled by derricks, as shown in Fig. 1. In this pit the reinforcing steel and the stepped form for the cutting edge of the caisson are placed. See Fig. 2. After the first lift of forms has been built, concrete is poured and allowed to set partially before the second lift of forms is started, as seen in Fig. 3. Only these two sets of forms, which are about 8 feet in height, are used in the construction of the well.

After the concrete has fully set in both lifts, the

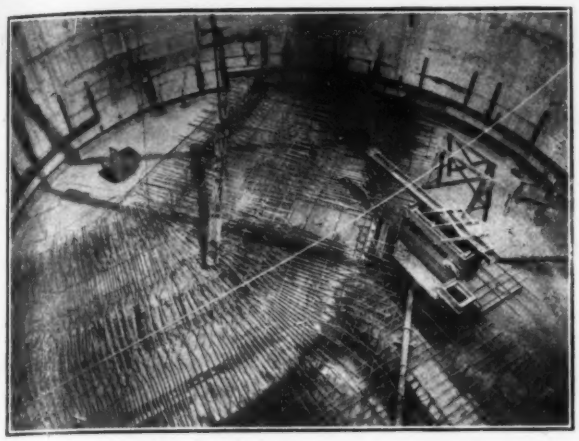


Fig. 5.—Interior Foundation Construction of Condenser Well.

first lift of forms is removed and excavation continued inside the caisson. The elevations of different points around the rim are taken at frequent intervals, so that the foreman may know in which places to continue digging. Up to a certain stage in the sinking, excavation must be done with great care, for if the caisson tilts more than a few degrees, the grip of the surrounding earth may prevent it from being straightened. If, on the other hand, the caisson is approximately plumb after the first few stages, this same earth pressure will hold it in line through the remaining stages.

When the caisson has settled for a distance of about 8 feet, excavation is stopped, the lower set of forms put on top of the second set and another ring of concrete poured. This is shown in Fig. 4. The operation continues in this manner until the well has reached the required depth, excavation during the lower stages of construction being carried on entirely under water.

It is not uncommon to secure a settlement of two or three feet in a day, though at times the caisson will remain almost stationary for a number of hours, and then suddenly take a dip to one side, requiring very careful work to bring it once more to the level position.

When the cutting edge has reached the proper elevation, the bottom is rounded out and a concrete seal is placed by means of submarine buckets handled by derricks. This seal is allowed to set for about three weeks, when the water can be pumped out of the well and the interior construction completed in the dry. See Fig. 5.

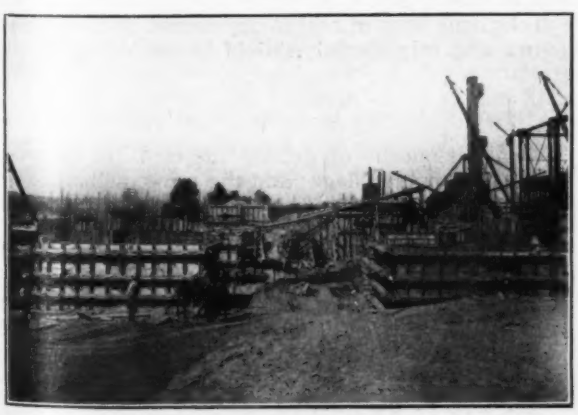


Fig. 6.—Boiler-House Foundations Under Construction.

Practically the same method is used for the tunnel sections, temporary bulkheads being placed in the ends of each section. After these sections have been sunk to the proper depth, they are connected by driving sheet-steel piling on either side, to form a water-tight compartment. This is excavated by means of either a small orange-peel bucket or a sand pump and, where necessary, with the assistance of a diver. The seal between adjacent sections is put in place and the connecting side walls poured. After the concrete has set, the bulkheads may be removed and the tunnel roofing completed.

The rectangular and circular piers for the boiler and switch houses, Figs. 6 and 7, are sunk in the same way as the tunnel sections, except that there are no joints to be made. On the circular piers only one lift of forms is necessary on the outside, this lift being loosened and clamped again by means of wire rope rings which fastens it to the concrete which has already set.

There is no concrete connection between the intake and the condenser wells, the water being carried between these two by means of 48-in. cast-iron suction pipes. The holes left in the concrete walls to receive these pipes and the inside dimensions of the tunnels,

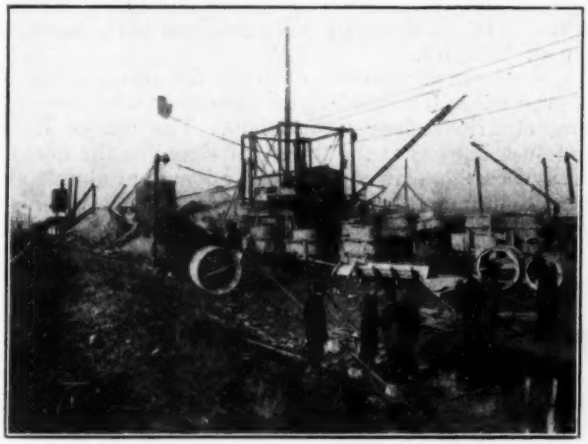


Fig. 7.—Switch-House Piers Under Construction.

are all made slightly larger than is absolutely necessary, in order to allow for the slight variations in alinement which are unavoidable in construction of this kind.

The mouths of the intake and discharge tunnels cannot be constructed in the manner described above, as they are located at a level which is entirely under water at all times. Timber cribs are constructed of 12 by 12's on the bank of the river, all joints being caulked to make them water-tight. These cribs are launched and floated into position, where they are gradually sunk by building up with 12 by 12's until the bottom has reached the proper level. No concrete is used until the seal is poured under water. When this has set, the crib can be pumped out and the mouth of the tunnel completed in the dry.

Construction of the plant for the Kansas City Light & Power Company is being carried out under the direction of G. B. Mitchell, superintendent, and under the general supervision of The Foundation Company's Chicago office, of which F. W. Adgate, a director of the company, is manager.

Electricity in Coal-Mining Operations

Mine Signaling and Telephone Systems—Data on Rope Haulage—Miscellaneous Applications

By FRANK HUSKINSON

Chief Electrician, Rocky Mountain Fuel Company.

This is the last of a series of articles dealing with electric power applied to the numerous phases of coal-mining operations, including surface and underground haulage, drilling, undercutting, pumping, singnaling and coal handling. The series also gives interesting facts relative to changing from the isolated power plant to central-station service. The questions of mine lighting and telephone systems and electric blasting are also given attention.

SIGNALING service for mining operations must be absolutely reliable in the face of the most adverse conditions. A system that falls short of that quality would result in confusion and might easily cause damage to property and accidents to persons. In workable systems, primary batteries are considerably used in connection with bells and relays.

In mines having electric power, several ways and methods of signaling are in use. One of these utilizes the bell-ringing transformer instead of the primary battery. Another method is to use a bank of lamps in series, to cut down the voltage, these being used in lieu of batteries.

Block signal systems, constitute the forms adopted in most mines for signaling the motormen who are running electric-haulage locomotives. The use of bells and push buttons at the tipple for signaling the dumpers and the box-car engineers, is adopted at almost all mine tipples, and seems the only reliable and satisfactory means of signaling.

One of the uses to which electricity is put at coal mines consists of maintaining electric signs, such as "Danger" and "Safety First," some of which may be controlled by "flashers." Another phase of safety and utility is to place electric lamps at all partings and at places where there are mine telephones. Another way that contributes to safety is to place electric green lights at whitewashed stations along the slopes and haulage routes, these being safety places for the men in getting out of the way of trip cars.

As a means of further utility and safety, electric lamps are placed at all dangerous places in the mine; and red lamps are placed at electric switches and near other electrical machines and devices.

The Telephone in Coal Mines.

The telephone system at coal mines has become one of the essentials in modern mine operating. It accomplishes a great saving of time in transmitting routine orders, in quick notification of the temporary suspension of power, of an accident, or any emergency affecting the hazards of life and property. Its utility in all matters of economy and safety justifies the expense of installation and maintenance many times over.

Most systems consist of several instruments and a set of wires forming a party line; and by the local battery magneto telephones signaling is by a code of rings.

Underground telephones are enclosed in heavy metal cases which are fire, moisture and rust proof, these protections being necessary on account of underground conditions as to moisture, gases and acid water. It is necessary that loud, distinct rings be emitted, so they may be heard for long distances underground. In mines having a large number of telephones underground and on the surface, the usual plan is to have a switchboard at a convenient place, preferably at the mine office, this being the most serviceable installation. With a system having all the telephones tied together the use of a central switchboard makes it easy to locate any trouble on the circuits due to wires getting crossed with the power lines. In such cases, where the ground return is used the telephones on the section affected will burn out. If a metallic return is used in the system, a trouble due to connecting power lines with the telephone wires can be located at the switchboard, as the drop on the lines which are crossed with the power lines will cause a loud buzzing sound at the receiver. This difficulty is one of the worst troubles and is often present on lines that run along the same mine entry with several power and trolley lines. Transposing the lines does very little good, as it is an induced current. The trouble is best obviated by running the telephone lines as far away as possible from the power lines when the two systems of lines are required to run along the same entry.

In many mines where rope haulage is used the trip-rider is provided with a portable telephone set, that he can connect to the regular signal lines, and talk to the hoistman in case of trouble. This portable telephone has a special condenser in it so that the current on the signal lines will not interfere with it; and signaling is done by a code of rings with the regular signal bell. Magneto generators and polarized bells are in use in some parts of a coal mine as a means of signaling, but as a general rule this system of signals is for use in cases of emergency.

Telephone lines in coal mines should be installed in conduit and this conduit should be buried along the entry.

Other Features of Coal Mine Equipment.

The only means of getting the coal out of some mines is by rope haulage; and the same method is required, at other properties, to convey the coal down a mountainside to railroad cars.

In mines where the dip of the coal vein is several degrees from the horizontal, and when in opening the mine the haulageway was run practically on a level plane, the coal, after being gathered by electric locomotives, is lowered or raised to the haulage road according to whether the stratum of coal is above or below the level of the traction line.

Another machine in use at some of the coal mines consists of a shoveler, operated by an electric motor,

to load the coal into pit cars, after the vein has been undercut by an electric mining machine, drilled by electric rotaries, and blasted down by electrically firing the charge.

The coal in cars, when electrically hauled out to the tipple is dumped upon electrically-operated picking tables for sorting, and moved thence to the electrically driven car loader.

WELDING A SHIP TOGETHER ELECTRICALLY.

Facts Concerning Great Britain's First Electrically-Welded Ship.

Particulars are now available of the interesting—and completely successful—experiment in rivetless shipbuilding, carried out at a yard in the British Isles. The first steel vessel constructed entirely without rivets was recently launched in England. She has since been in service with full cargo during exceptionally rough weather, answering satisfactorily in every way to the severe tests imposed.

The object of the experiment was to prove the ability of welded construction to withstand the strains peculiar to a ship at sea. It is not proposed altogether to dispense with riveting, which in certain sections is cheaper and quicker than welding. It is intended, however, that future vessels should be a combination of riveting and welding. The United States Shipping Board, for instance, having been in close touch with the experimental work, is making arrangements for the construction of a number of 10,000-ton standard ships, in which the use of rivets will be reduced to 2½ per cent of the number originally required.

The recent progress achieved in electric welding by means of the flux-coated metal electrode process, and its successful use at Admiralty (British) dockyards and elsewhere in the construction of fitments and superstructures of various vessels led to permission being obtained for the erection of a standard barge, with riveting eliminated and electric welding substituted throughout. Such a craft, it will be observed, is exposed to considerable rough usage in dock, besides being subjected to severe towing strains. In order to utilize material already available on site, this barge differs in no way from the standard riveted type with lapped joints, excepting that the hull plates were arranged for clinker build and plate edges joggled to permit horizontal downward welding in order to reduce the amount of overhead work, which is more difficult of execution.

The vessel to be welded was 125 ft. between perpendiculars and 16-ft. beam, with a displacement of 275 tons. The hull was rectangular in section amidships, with only the bilge plates curved. It was built up of 71 transverse frames and contained three bulkheads, those fitted fore and aft being watertight and the one amidships non-watertight. The shell plating was ¼ in. and 5/16 in. All joints were lapped in the manner described.

Though all the operators were first-rate men, with extensive experience of electric welding in the shops and minor repairs and structural work at shipyards, the first day's work was poor, probably due to the novelty of the undertaking and to the position—lying flat on the keel—which they had to adopt to get to the joints. In a few days, when the men had become accustomed to the job, the speed and quality of the work improved to equal workshop standard practice. With the more difficult welding, such as the vertical butt joints on each shell plating, and overhead work underneath the keel and on bilge plates, it was noted that the quality of the welds was excellent. For this overhead work special electrodes were employed and proved well worth the slightly increased cost. All watertight joints up to and including the underside of bilge plates were continuously welded both inside and outside, the other water-tight joints being welded continuously on one side and tack welded on the other. On the shell plating, the continuous welding was on the outside in all cases.

For internal non-watertight joints and frame construction tack welding was adopted, the length of welding being carefully calculated to give a margin of strength over a similar riveted joint.

Taking all positions of work into consideration, the average speed at the commencement was 4 ft. an hour, while towards the end of the work an average of 7 ft. an hour was easily obtained.

Some interesting details are provided of the comparative cost of the electric welded and riveted barge. In labor, 245 man-hours were saved in construction, and in future work even better results can be expected. Owing to the absence of rivets, more than 1000 lbs. of metal was saved, and greater economy still will result when the design is modified to suit electric welded ship construction. The total cost of welding was $1468, detailed as under:

Electrodes	$ 865
Electric current	297
Men's time	306
Total	$1468

The Admiralty experts have realized the proportion of cost for electrodes is high, but this is mainly due to the present limited demand. Demand and competition will have the usual effect, and a reduction in the cost of this item by at least 60 per cent should come. It will then be possible to build a vessel of 275 tons, 125-ft. length and 16-ft. beam, with an estimated saving of from 25 to 40 per cent of time and about 10 per cent of material.

It is interesting to add that, as a result of this demonstration, the yard has prepared a new design of barge, in which it is proposed to incorporate electric welding and riveted construction to the following extent:

To Be Welded.	To Be Riveted.
Coamings.	Floor riveted to frames.
Shell seams to frames.	Beam knees to frames and beams.
Deck butts to beams.	Frames clear of shell seams.
Bulkheads (including boundary bars).	
Keel plate butts to be welded overlaps.	
After shell seams welded.	

NEW BUSINESS AT OKLAHOMA CITY.

During the month of August the New-Business Department of the Oklahoma Gas & Electric Company, Oklahoma City, Okla., in conjunction with the dealers placed 452 domestic electrical appliances on the lines of the company, including 157 electric fans, 106 electric vacuum cleaners, 104 electric irons and 18 washing machines. The total new business added for the month equals 450 hp.

Editorial Comment

"All That We Have"

WE ARE asked once more to lend our money to winning the war by subscribing to the Fourth Liberty Loan. We are asked only to loan our dollars, not even to give, for the winning of a great safe peace that will exterminate the cursed doctrine that might is right, and again make the world a safe place to live in.

President Wilson has given prompt answer to a proposed peace by agreement, which means an armed peace. "Unconditional surrender" are our terms, to win which war must be waged against the Hun till victory is won. And each of us can hasten the day of victory and lessen the suffering and agony of our people and our brave Allies by lending his dollars to winning the war soon. We cannot all go, but we can all give. A shot from the Huns' Big Bertha may go 75 miles, to wreck cathedrals and kill and maim children, women and old men. A Liberty Bond can go 3000 miles and more to Berlin, and come back again when a lasting peace is won. You are only asked to lend your dollars to victory, where so many more are offering their lives.

Let each one of us, members of a great and prosperous industry, citizens of a free, happy country, make and then go out and keep the pledge made by the National Electric Light Association at its convention last June. In the words of that noble pledge, "With a realizing sense of the stupendous sacrifices involved, but with an abiding faith in the ultimate result, we pledge all that we have and all that we are to the holy cause." Go out and lend your dollars to winning a great, safe peace that will bring healing to a bleeding world.

Care in Replacing Carbon Lamps

INTENSIFIED progress in many lines of scientific and industrial development has resulted from the peculiar needs of the war. This is especially true of the various fuel-conservation measures necessitated by almost desperate efforts to avoid a coal famine. One of these measures is the recent order of the Fuel Administration substantially prohibiting the further manufacture of carbon-filament incandescent lamps on account of their well known inefficiency, which entails considerable waste of coal in the production of electricity for lighting. These lamps have been in the obsolete class for many years, but their use, while gradually diminishing, has persisted so steadily that it has elicited wonder among lighting men at the short-sightedness of lamp purchasers still demanding them. It is not necessary to refer to the conservatism and other reasons that account for this prolonged clinging to this old and sturdy but wasteful lamp. Suffice it to say that many lighting interests have heralded the order of banishment with unconcealed joy.

While rejoicing at the suddenly accelerated departure of this relic of early electric lighting days, it is not amiss to point out a caution that should be observed in making the lamp replacements. It is to be expected that these replacements will be made on an equal wattage or equal candlepower basis, depending on whether the purchaser is eager to buy more light for the same current, or the same amount of light for less current. In either case most of the replacements will be made lamp for lamp with no other change of equipment. In fact, since so large a part of the old carbon lamps are used on drop cords, bare and without reflector or shade of any kind, the new tungsten-filament lamp will introduce a greatly aggravated glare problem unless dealers and distributors of the lamps seize the opportunity to educate their patrons on the need for guarding against the increased glare by use of suitable diffusing or reflecting equipment.

Manufacturers of such equipment should instruct their salesmen, as well as their district or jobbing representatives, to urge all local dealers to avail themselves of this exceptional opportunity for educating the public on the several disadvantages of using bare lamps and how readily in many instances the illumination will be vastly improved by use of a good reflector. While lamps are being replaced in order to promote fuel conservation, we may as well go one step further and promote real light conservation and eyesight conservation at the same time. The ordinary public does not realize that a bare lamp is wasteful of light and use of a proper reflector helps to conserve light by directing it where it is needed, instead of shining into the eyes where it is injurious, or too much on walls and ceilings where it is so largely wasted. A big opportunity is therefore presented for radically improving lighting by making it more efficient and at the same time more agreeable.

Welding Electrically

WE HAVE on several occasions in the past made mention of the rapid development and evolution of electric welding and cutting in place of rivets for the former and various gases for both welding and cutting.

Elsewhere in this issue will be found some extremely interesting information relative to the construction of a ship in Great Britain where riveting

was very largely replaced by electric welding. The results were found so satisfactory, financially and physically, that more ships with fewer rivets are now in course of construction.

Electric welding, like so many other things, has come on apace since the war, because of the vital need for conserving labor, time and materials, hastening production, keeping down cost, and making an operation as simple as possible. Electric welding has been claimed to possess these advantages, with many more such as enabling a reduction in the weight of a ship, offering less opposition to passage through the water, which at the same time requires less effort for propulsion.

While at present improvement and development of electric welding of ships is in the limelight, and rightly so since ships are of such paramount importance in taking men and munitions "over there" and carrying food and products overseas, it seems to the ELECTRICAL REVIEW that when there is less haste, greater deliberation and more time to spare that electric welding may to good advantage be applied to other purposes than welding ships together instead of riveting them. For example, failed and defective boiler tubes are now being welded, and made as good as new time after time, in certain central stations. Many jobs on boilers and in power plants could be done by welding electrically. In the construction of automobile and truck frames the weld in place of the rivet would surely reduce the weight, speed up production while cutting the cost, reacting to the benefit all along the line from purchaser to the people who pay for the upkeep of roads. Many more such instances could be mentioned, but we just offer the thought to those awake to its possibilities.

Reducing the Evening Peak

IN A FEW weeks now, October 27, the hour of daylight gained to usefulness last May when all clocks were moved one hour ahead, will be lost, officially, because then the clocks are to be moved back one hour. The measure was a daylight-saving measure, and as the daylight is dwindling and is no longer able to replace artificial illumination, the measure now hibernates until March comes again.

With the coming of shorter days will come conspicuously before us the evening peak load, with all its objections, inconveniences and expense. And when putting the clock back an hour comes the opportunity —which should not be missed—of reducing the peak. A very great deal can be accomplished by having a diversity of the individual loads, by spreading the time for starting and stopping work over a wider period than has ordinarily been done heretofore. To change the time of starting and quitting work simultaneously with putting the time back an hour would result in merely a change of time and not of habit, half the battle.

For many years it has been the custom in London and other European cities and in a few instances in this country for foundries, machinists and shipyards, etc., to start work anywhere between 6:00 and 7:30, which enables the men to leave their work before other workers start for home. And then, when starting earlier the men are ready for lunch sooner, and this diversity between various plants means reducing the deep valley in the load curve during the half or one-hour noon daily with its banked fires and waste of coal.

Only a few weeks remain for an organized effort on the part of chambers of commerce, boards of trade, civic welfare organizations and merchants' and citizens' associations in co-operation with the local central station to reduce the demand peak by diversifying the loads of individual customers, thus saving coal, improving city and interurban travel, making it safer, more expeditious and sensible. Nevertheless, while this ideal and most efficient co-operation may not be possible, there is nothing to prevent a factory here and there, in fact, any industrial plant, from adhering to the habit formed during the few months of daylight saving and while putting the time back an hour maintaining its working hours an hour earlier, according to the new order of things. And there is a further gain in so doing where energy is purchased on the "off-peak" basis.

So much has been said about the extra investment and the fixed charges necessary to take care of the additional equipment required for the evening peaks and their influence upon power and lighting rates that everyone is vitally concerned in doing everything feasible to reduce this evening peak, that is not entirely but very largely needless.

Shortage of Hydroelectric Power May Hasten Action of Congress

THE OUTPUT of power from hydroelectric plants of California has been materially reduced this season by the drought and low-water supply in the Sierra Nevada Mountains. This is the result of the lighter rainfall during the spring and summer months and of limited snowfall last winter.

One of the consequences of this electric power shortage in California was a curtailment of gold-dredging activity. It is reported that 47 dredging companies have voluntarily reduced by one-third their consumption of power from hydroelectric plants, releasing that much energy for use in plants more directly connected with war industries.

In this connection attention may be called to the shortage of electric power east of the Mississippi River, and that this situation both east and west is very potent at this time in influencing Congress to take prompt action on the administration water-power bill recently introduced by Representative Sims. This bill provides for Federal construction of water-power plants.

THE WHITE HOUSE
WASHINGTON

Again the Government comes to the people of the country with the request that they lend their money, and lend it upon a more liberal scale than ever before, in order that the great war for the rights of America and the liberation of the world may be prosecuted with ever increasing vigor to a victorious conclusion. And it makes the appeal with the greatest confidence because it knows that every day it is becoming clearer and clearer to thinking men throughout the nation that the winning of the war is an essential investment. The money that is held back now will be of little use or value if the war is not won and the selfish masters of Germany are permitted to dictate what America may and may not do. Men in America, besides, have from the first unite now dedicated both their lives and their fortunes to the vindication and maintenance of the great principles and objects for which our Government was set up. They will not fail now to show the world for what their wealth was intended.

Woodrow Wilson

Week's Events

Illinois Contractors Meet—Convention of Municipal Electricians — Executive Committee Meeting of N. E. L. A.

ILLINOIS STATE ASSOCIATION HOLDS WAR-TIME CONVENTION.

Resolutions Pledging Support Adopted at Peoria Meeting —Address by W. L. Goodwin Feature of Program.

The semi-annual meeting of the Illinois State Association of Electrical Contractors and Dealers was held on Sept. 19 and 20 at the Hotel Jefferson, Peoria, Ill. Judged from the standpoint of constructive activity, this was, by far, the most successful meeting ever held by the Illinois association.

Uppermost in the minds of the contractor-dealers were, of course, war-time problems, and therefore a considerable portion of the time was devoted to the discussion of ways and means for maintaining the status of the electrical contracting and merchandising business and, at the same time, co-operating to the fullest possible extent with the government in placing the industry on a war-time basis. The sentiment of all those in attendance was clearly expressed in the following resolution which was adopted at the meeting:

RESOLVED, That the Illinois State Association of Electrical Contractors and Dealers, in convention assembled, for itself and all of its members, solemnly pledges its full and sympathetic co-operation with the Government, the War Industries Board, the Priorities Board and other Government agencies in making effective all measures designed to conserve materials, labor and capital, to the end of developing maximum industrial productivity and to the end of diverting and applying that maximum productivity to the successful prosecution of the war. And the Association, for itself and all of its members, further solemnly pledges itself to use every endeavor to encourage like co-operation and to secure compliance with the requirements of such conservation measures by all other individuals and groups in the electrical industry; and, be it further

RESOLVED, That a copy of this resolution be transmitted to the National Association of Electrical Contractors and Dealers and to the electrical and lay press, to be so used by the National Executive Committee and the press as it may deem best.

The entire session on Thursday morning was devoted to a meeting of the State Executive Committee. The matter of district organizations was extensively discussed, and each district chairman pledged his best efforts towards increasing local memberships and carrying out the constructive program of the association. The vital need of securing the co-operation of jobbers and central stations in order to make the association effective was clearly pointed out, and efforts will now be made to complete such co-operative arrangements at an early date. The contractor-dealers pledged their support of the jobbers in return for the jobbers' assistance in the organization work.

100% in the National Interest.

Our business to date for 1918 is running, on the whole, at about the same rate as in 1917. Our orders are now practically 100 per cent for the Government direct, or in the National interest. There is an especially urgent demand for power producing and using apparatus. There is no likelihood of any great change as long as the war activity continues.

No one is wise enough to make any useful prediction as to what will happen after the war. The magnitude of the forces involved—material, moral and intellectual—make certain that great and probably fundamental changes will result in all phases of human activity. However, we may face the future with courage, if as a nation we are wise enough to apply scientific methods and the Golden Rule to the solution of our problems.

E. W. RICE, JR.,
President, General Electric Co.

The afternoon session opened with an address of welcome by Willis Evans, executive secretary of the Peoria Merchants' Association. The response was made by J. A. Weishar, State chairman for Illinois. G. A. Engelken, State secretary, then made a report on the recent convention of the National Association and the work being undertaken by the National Association in assisting its members in their business. The balance of the afternoon was taken up by a general discussion of problems which are confronting the contractor-dealers. The matters brought up by the various members showed conclusively that they were earnestly striving to better their conditions, and the discussions greatly clarified the situation.

The evening's program consisted of an automobile tour of Peoria's beautiful natural parks, and a dinner at Ye Olde Tavern, a picturesque roadhouse several miles out of Peoria.

ADDRESS OF W. L. GOODWIN.

First on the program for the next day's session was W. L. Goodwin, who delivered one of those stirring speeches for which he has become noted in the electrical industry. With characteristic forcefulness he pointed out where the contractor-dealers had been remiss in their duty to their industry and showed them very plainly what could be accomplished if they would but work together for their mutual advantage. As usual, Mr. Goodwin was unsparing in his criticism of the fallacious policies which prevail in the industry and stated quite clearly the reasons why the electrical business is in its present condition. He emphatically warned all the electrical interests present that unless they proceeded immediately to get together and co-operate with each other, the industry would disintegrate still further, and gave it as his opinion that now is the best possible time for this co-operation to commence.

After Mr. Goodwin's address, Sullivan W. Jones, the Washington representative of the National Association, presented a paper on "How the Government Views the Electrical Contractor." The information conveyed by Mr. Jones was just what many of those present were greatly in need of and they were given a much clearer understanding of the situation than they ever had before. This was especially valuable to those contractors endeavoring to secure government contracts.

DEVELOPMENTS IN MERCHANDISING.

The afternoon session opened with a talk by Fred B. Adam of St. Louis, chairman of the National Merchandising Committee, who explained what the National Association is doing to develop the merchandising business. It was clearly pointed out by him that the National Association is opposed to any activities which are not in strict accord with the program of the War Industries Board and the Priorities Board, and that inasmuch as many of their plants were designed to meet pre-war conditions, they must now, of necessity, be postponed until after the war. Nevertheless, he showed that there is a very profitable field for the electrical merchant in war time and the National Association is doing everything in its power to assist its members to conduct their businesses successfully.

A similar treat to that which was enjoyed by those who attended the National Convention in Cleveland last July was given those present at this meeting. John R. Smith and A. McWilliams of the Electrical Estimators' Association of Chicago presented another remarkable paper on estimating electrical work and in addition presented them with some specially prepared forms for estimating and checking bids.

The question of relations between contractor-dealers and jobbers and manufacturers was very ably handled by George Loring, president of the R. I. Electric Co., who presented a practical plan of providing suitable discounts for compensating contractor-dealers, thereby insuring the fullest co-operation between all interests, eliminating wasteful overlapping services and resulting in better service to the public.

The last speaker was C. M. Caldwell of Champaign, who presented a very interesting and instructive paper on the sale and installation of farm lighting plants. Mr. Caldwell is himself a contractor-dealer and is keenly interested in the development of this branch of the business. His advice was of value to many of the contractor-dealers present.

The convention ended with a splendid banquet and ball at the Jefferson Hotel.

The constructive work inaugurated at this meeting has injected a renewed spirit into the contractor-dealers of Illinois and will go a long way towards remedying some of the evils which exist in the industry today.

PRESIDENT URGES PASSAGE OF POWER BILL.

Asks Congress to Authorize Control of Electric Power Plants at Once.

President Wilson has asked Congress to pass promptly as a war measure the emergency power bill authorizing Government control and extension of electric plants and providing a fund of $175,000,000 for the purpose. In a letter to Representative Sims, chairman of the House Interstate Commerce Committee, which has reported the bill favorably, the President wrote:

"In view of the possibility of three-day adjournments by the House and the absence of a quorum from the city, I venture to write you this hurried note to urge that the emergency power bill be pressed to passage if possible, before adjournment, as it is of capital and immediate importance as a war measure. I hope that it will be possible for you to obtain consent of the house to this action."

Receipt of the letter followed an unsuccessful attempt by Representative Sims to get unanimous consent of the House for consideration of the bill immediately following action on the prohibition measure.

The principal provisions of this bill were presented on page 331 of the ELECTRICAL REVIEW for August 31, 1918.

MUNICIPAL ELECTRICIANS MEET IN ATLANTA.

Papers and Addresses of War-time Interest Prcsented at Three-day Convention.

The twenty-third annual meeting of the International Association of Municipal Electricians was held at the Piedmont Hotel, Atlanta, Ga., September 24 to 27. The program was one of the most instructive which the association has ever attempted and in spite of war conditions there was an unusually large attendance.

The meeting was opened by an address of welcome by A. G. Candler, mayor of Atlanta, and a fitting response in behalf of the delegates was made by Dr. Charles P. Steinmetz. Following the address by President C. E. Diehl, city electrician of Harrisburg, Pa., the following program was carried out.

Report of Municipal Electrical Standardization Committee, presented by R. A. Smith, superintendent of electrical affairs, Norfolk, Va.

"Standard Specifications for Underground Fire-alarm and Police Signal Cable," by John Berry, superintendent of fire alarm, Indianapolis, Ind.

Address: "The Application of Science and Electrical Engineering," by A. M. Schoen, chief electrical engineer, Southeastern Underwriters' Association, Atlanta, Ga.

"Police Call, Report and Signal System," by Jacob Grimm, superintendent of police signal system, Buffalo, N. Y.

Illustration by motion-pictures and lecture of electrical development and manufacture, by F. A. Barron, Schenectady, N. Y.

"History and Development of the Fire Alarm Telegraph," by J. B. Yeakle, superintendent of fire alarm, Baltimore, Md.

"Development, Cause and Location of Trouble in Rubber Insulation," by B. S. Stewart, of the Peerless Insulated Wire & Cable Co., New York, N. Y.

"The Joint Use of Poles by Public Service Wire Companies," by A. L. Pierce, electrical engineer, Wallingford, Conn.

Address: By Dr. Morton G. Lloyd, electrical engineer in charge of safety work of Bureau of Standards, Washington, D. C.

Address on "How the Municipal Electricians Can Help in Fire Prevention," by Washington Devereaux,

president of the National Association Electrical Inspectors and of the Electrical Department of Underwriters' Association, Philadelphia.

"The Sale and Purchase of Non-approved Electrical Appliances and Material," by F. A. Cambridge, city electrician, Winnipeg, Man., Canada.

Address on "Practical and Technical Application of Electrical Science," by Dr. Charles P. Steinmetz, consulting electrical engineer, Schenectady, N. Y.

"Importance to the Public of Inspection of Interior Wiring," by William S. Boyd, secretary of Western Association of Electrical Inspectors, Chicago, Ill.

"Educating the Public in the Use of the Fire Alarm Box," by John W. Mangum, city electrician, Raleigh, N. C.

"A Code of Electrical Rules for Municipal Inspectors Covering both Fire and Accident Prevention," by Dr. M. G. Lloyd, electrical engineer, Bureau of Standards, Washington, D. C.

"Underwriters' Laboratory Test as Applied to Electrical Material in War Times," by A. R. Small, vice-president of the Underwriters' Laboratories, Chicago, Illinois.

"The Advantages of a Police Patrol System to a Municipality," by E. E. Salisbury, signal engineer, Boston, Mass.

A more complete report of this convention will be presented in our next issue.

NEW YORK COMMISSION ESTABLISHES BASIS FOR RATE INCREASES.

Advances Will Be Determined by Pre-War Earnings—Surplus Must Be Exhausted Before Relief Is Granted.

The Public Service Commission, First District, New York, has issued an interesting opinion establishing a basis upon which public utilities must make application for rate increases. This opinion has been issued by the Board in anticipation of a general demand on the part of electric light and power as well as gas companies for permission to advance rates of service. It holds that where a company is deriving a fair return on its investment it is not justified in seeking an increased rate on account of the advanced cost of labor and materials; also that rate increases must be denied to utility companies which have earned more than a reasonable return in the past on their investments and have a substantial balance at disposal—such balance must be exhausted before the company shall have any standing in a plea for financial relief. The Board also sets forth that any relief granted must be within reasonable and lawful limits, and must be on account of conditions brought about by the war which demand rate increases as a matter of conserving and continuing proper service of light, heat, power and the like.

In its opinion, the Board says, in part:

Emergency increases are granted only to enable a company to meet a genuine emergency. A public utility company is not entitled immediately and almost automatically to raise its rates as fast as operating costs go up, any more than the company voluntarily and automatically decreases its rates as fast and as far as costs go down. The level and trend of rates should follow and generally conform to the level and trend of prices—anything else is disadvantageous to the public as well as to the company. But a company is not entitled to "emergency relief" to preserve returns of normal conditions if those returns have been excessive or if the company's rates have been such as to permit it lately to accumulate surpluses or unwarranted reserves, which may first be drawn upon before its services of finance can be said to be in immediate danger.

SAFETY CONGRESS HOLDS PUBLIC UTILITY SESSION.

Prominent Central-Station Operators Discuss Safety Measures at St. Louis Meeting.

In connection with the seventh annual safety congress of the National Safety Council, which was held the week of Sept. 16 at the Hotel Statler, St. Louis, Mo., there was held a public utilities sectional meeting on Wednesday, Sept. 18. C. B. Scott, general manager, Bureau of Safety, Chicago, Ill., was chairman of the meeting. Following the reports of standing committees, the following papers and addresses were presented:

"Interesting the Public in Co-operative Accident Prevention," by Herman Spoehrer, secretary and treasurer, Union Electric Light & Power Co., St. Louis, Mo.

"A Modern Idea of Accident Prevention," by Herbert W. Moses, superintendent welfare bureau, Edison Electric Illuminating Co. of Boston, Mass.

"First Aid to the Injured and Its Bearing on Accident Prevention," by John Bailey, superintendent of safety, Bell Telephone Co., Philadelphia, Pa.

"Practical Demonstration of Resuscitation Methods," by H. B. Harmer, safety engineer, Philadelphia Electric Co., Philadelphia, Pa.

"Modern Practical Methods of Accident Prevention in Small Companies," by Wills Maclachlan, inspector, Electrical Employers' Association of Ontario, Toronto, Ont., Canada.

COLONEL JUNKERSFELD TO SPEAK IN CHICAGO.

Emergency Construction of War Department Willl Be Discussed on Oct. 1—Meeting Under Aspices of Technical Societies.

Under the auspices of the War Committee of the Technical Societies of Chicago, there will be a meeting on Tuesday, October 1, in Fullerton Hall, Art Institute, Chicago, Ill., at 8 p. m., at which Colonel Peter Junkersfeld, Construction Division, Quartermaster Corps, U. S. A., will present a paper, entitled, "Emergency Construction for the War Department in the United States." Colonel Junkersfeld is well known in electrical circles as assistant to the vice-president of the Commonwealth Edison Co., Chicago, in charge of engineering. He has been in Government service since the entrance of this country into war and has been prominently identified with electrical construction at the various army cantonments and encampments, and more recently has had charge of all electrical construction work at the new Government docks at eastern seaports.

The meeting on October 1 will be the second of a series to be held by the joint organization of technical societies in Chicago. Edgar S. Nethercut is secretary of the committee.

EXECUTIVE COMMITTEE OF N. E. L. A. MEETS

New Committees Appointed and Reports of Section Chairmen Presented.

A meeting of the Executive Committee of the National Electric Light Association was held at the Association offices, New York City, September 13.

President W. F. Wells stated that in accordance with the Constitution, the secretary must be nominated by the president and confirmed by the Executive Committee. He therefore nominated T. C. Martin, and the Committee confirmed the nomination. E. W. Burdett was re-elected general counsel and W. H. Blood, Jr., was re-elected insurance expert.

President Wells stated that a number of people, chairmen of committees, etc., had asked what the policy of the Association for the coming year is to be, and that it was therefore felt that it would be wise for the Executive Committee to adopt a resolution somewhat similar to the one adopted by the Association at the Atlantic City convention. Therefore the following resolution had been drawn up, which Secretary Martin read; it was adopted.

RESOLVED, That this Association undertake to do no work during the present Association year other than that which is absolutely essential for the winning of the war, but that National and Sectional committees, familiar with their respective lines of endeavor, be organized so that they may be called into active service in case any emergency arises and consider such other matters as the Executive Committee may deem necessary.

President Wells presented the names of the chairmen of the several National committees, who had been appointed subject to the approval of the Executive Committee. The appointments were approved as follows:

Constitution and By-Laws, W. C. L. Eglin, chairman; Doherty and Billings Prizes, Paul Lupke, chairman; Finance, Joseph B. McCall, chairman; Lamp, Frank W. Smith, chairman; Class C Membership Applications, Walter Neumuller, chairman; Membership, Walter Neumuller, chairman; Public Policy, W. W. Freeman, chairman; Rate Research, Alex Dow, chairman; Relations with Educational Institutions, J. F. Gilchrist, chairman; Safety Rules and Accident Prevention, W. C. L. Eglin, chairman; Valuation Terminology, J. N. Shannahan, chairman; Exhibition, J. W. Perry, chairman.

President Wells reported that the Public Policy Committee had held one or two meetings, and as most of its work had been in connection with the activities of the National Committee on Gas and Electric Service, he would ask Chairman Lieb of that committee to make a report.

Mr. Lieb referred briefly to the work of the National Committee, explaining that it was organized to help in solving problems of service and co-operation between the gas and electric light and power interests and the National Government, and that it had refrained from activities along the lines of legislation and the consideration of problems of finance. He stated that the expenses of the committee, including salaries, rent, telephone and telegraph service, postage, etc., amounted to a large sum each, which had been divided between the gas interests, the electric light and power interests, and the natural gas interests, through their respective associations, about in the ratio of the gross incomes of the three groups. Under this plan the amount assessed the electric light and power interests was about one-half. The question as to whether this amount should be paid by the N E L A or levied on the member companies was discussed by the Public Policy Committee and also by the Executive Committee, and it was decided that the balance sheet of the Association made it practicable for this assessment to be paid out of the current funds of the Association. At the recent meeting of the Public Policy Committee it was voted to recommend to the Executive Committee that this assessment be paid by the Association.

In connection with the scope of the work of the National Committee on Gas and Electric Service, Mr. Lieb spoke of the need that developed early for a committee to handle matters of rates, taxation, finance, etc., and the consequent appointment of the Committee on Public Utility Conditions, consisting of P. H. Gadsden as chairman, and H. H. Crowell and E. K. Hall, also the appointment of the Advisory Committee of nine with himself as chairman pro tem and Mr. Martin as secretary. He also mentioned that the expenses of this committee were being raised by voluntary contributions.

Mr. Lieb explained that in the consideration of the various methods of saving fuel through the co-operation of the public utility companies, the Fuel Administration had brought to its attention the fact that a number of inefficient lamps were still being used, and the question was brought forward as to whether there should not be limitations imposed upon the manufacture of these lamps. As a result, a conference of the lamp manufacturers was called in Washington, and it was decided that something could be done along these lines, and a committee of the lamp manufacturers was appointed with Mr. Lieb as temporary chairman. At a later meeting he was appointed chairman.

Mr. Lieb added that the United States Government does not yet possess power to make explicit orders to cover what is necessary in this program of limitation, although the Fuel Administration in reality controlled the situation through power over fuel supply to everybody, but that it is an appeal to the public and the public utility companies to co-operate with the Fuel Administration.

Chairman McClelland of the Technical Section reported that the Section Executive Committee had not yet met but that he proposed to call a meeting early next month. The most serious problems for technical men these days, Mr. McClelland stated, are coming from the generating stations and the work of the Prime Movers Committee is accordingly most important. Therefore it is proposed, unless the Executive Committee objects, to have this committee meet once every two months to discuss problems of coal storage, boiler capacity, etc. It is also felt that the work of the Electrical Apparatus Committee is sufficiently important for the committee to hold two or three meetings, to discuss particularly the largest possible production from existing apparatus. It may also be necessary to have one or two meetings of the Underground Construction Committee, but the other committees of the Section, Mr. McClelland stated, would probably not meet at all.

Reports were also presented by the respective chairmen of the Accounting and Electric Vehicle Sections.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES.

Display at New York Exposition Depicts Remarkable Progress of Last Two Years.

Chemistry has come to its own in the United States. It was gratifying to every good American who attended the National Exposition of Chemical Industries to have proved for him that we are in this country now dependent upon no one. From Sept. 23 to 27, thousands upon thousands thronged those three whole floors in the Grand Central Palace in New York City and were amazed at what they saw.

It was a show for everybody. Who, man or woman, is not interested in dyes? And we have accomplished wonders there. Or perhaps it was that impressive exhibit of the Buffalo Foundry & Machine Co. containing one of the great Hough type nitrators used in the manufacture of TNT picric acid, capable of circulating 5000 gallons per minute. And from that to the Du Pont American Industries—show of shows—where the by-products of explosive manufacture reach up into the hundreds. Or perhaps one became lost in the mazes of an electric lighted chart, exhibited by the Barrett Co., showing close to 175 derivatives of coal tar—about 200, altogether, from coal.

Coincident with the exposition was a program consisting of a series of symposiums devoted to a consideration of "The Development of Chemical Industries of the United States Since July, 1914."

Great credit for this elaborate program is due Charles H. Herty, chairman, Advisory Committee. He spoke at the opening meeting, Sept. 23, as did also W. H. Nichols, president of the American Chemical Society; F. J. Tone, president of the American Electrochemical Society, and G. W. Thompson, president of the American Institute of Chemical Engineers.

There was much in the program to interest the electrical profession. So important was hydroelectric power and its applications considered that the evening of Sept. 23 was given up to these subjects: A motion-picture exhibit showing the Falls of Iguizu, Argentine; Power of Wealth, Hydraulic Development; Power Transmission (4 reels); Canadian Shawinigan Falls Power Development and Its Surrounding Chemical Industries (3 reels); Fixation of Atmospheric Nitrogen at Niagara Falls and Feeding the Soil With It.

On Tuesday, J. A. Switzer, of the University of Tennessee, described the water-power potentialities of eastern Tennessee, where some 600,000 hp. await development.

Another symposium was devoted to potash and the various methods of recovery, including descriptions of the electrical precipitation methods as applied to the recovery of potash from blast furnace and cement-kiln dust and fumes.

Throughout the three exhibition halls one constantly encountered the displays of companies well known in the electrical field, so intimately are the electrical and chemical industries related. Among the familiar names among the exhibitors were the following: American Pipe Bending Machine Co., Boston; American Transformer Co., Newark, N. J.; Barrett Manufacturing Co., New York; Bristol Co., Waterbury, Conn.; Canadian Electro Products Co., Montreal; Canadian Electrode Co., Montreal; Carborundum Co., Niagara Falls, N. Y.; Diamond State Fibre Co., Bridgeport, Conn.; Electric Furnace Co., Alliance, Ohio; Foxboro Co., Foxboro, Mass.; General Bakelite Co., New York, N. Y.; General Electric Co., Schenectady, N. Y.; Hooker Electrochemical Co., New York, N. Y.; Hoskins Manufacturing Co., Detroit, Mich.; Huff Electrostatic Separator Co., Boston, Mass.; Janney, Steinmetz & Co., Philadelphia, Pa.; Macbeth-Evans Glass Co., New York, N. Y.; J. L. Mott Iron Works, New York, N. Y.; Niagara Electrochemical Co., New York, N. Y.; Page Steel & Wire Co., New York, N. Y.; Precision Instrument Co., Detroit, Mich.; Pyroelectric Instrument Co., Trenton, N. J.; Republic Flow Meters Co., Chicago, Ill.; Rossendale Reddaway Belting & Hose Co., Newark, N. J.; Schaeffer & Budenberg Manufacturing Co., Brooklyn, N. Y.; Solvay Process Co., Syracuse, N. Y.; Thermo-Electrical Instrument Co., Newark, N. J.; Nehling Instrument Co., New York, N. Y.; Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

CHELAN FALLS PLANT TIED IN WITH WENATCHEE VALLEY SYSTEM.

Interconnection in Washington Utilizes Energy from New Hydroelectric Plant.

The Chelan Falls Power Co. has completed a hydroelectric plant of 1250-hp. capacity on the Chelan river, Washington, 40 miles north of Wenatchee. It comprises an S. Morgan Smith water turbine, direct-connected to an Allis-Chalmers generator, the turbine operating under a 40-ft. head. By means of a high-tension line from the plant to Entiat, the power is tied in with the system of the Wenatchee Valley Gas & Electric Co., of Wenatchee; the latter having two hydroelectric plants, one on the Wenatchee and one on the Entiat river, is a distributing company. The Chelan Falls Co. is now wholesaling its output to the Wenatchee Valley company.

The power load on its lines in the summer season consists of 1250 hp. for irrigation pumping, in which it is demonstrated that a lift of 150 ft. from the streams is practicable. There is a continuous load of 800 hp. for shops and small plants in Wenatchee and other towns.

MINNEAPOLIS COMPANY ESTABLISHES HIGH RECORD IN OUTPUT.

Kilowatt-Hour Output of 893,310 on Sept. 10, Highest in History of Company.

Another high record in electrical energy output has been established by the Minneapolis General Electric Company. On September 10 the kilowatt-hours generated amounted to 893,310, compared with 861,690 on September 5, which was the highest record since November 27, 1917. It is estimated that 1000 electric heaters have been connected by the company during the Fall season, these heaters having an approximate connected load of 500 watts each. The demand for them still continues. During the week ended September 14 the sales department of the company accepted contracts for new business requiring 320 kw. of lighting and 49 hp. in motors. New business connected to the company's lines shows an increase of 126 customers with 784 kw. of lighting. The output of electric energy was 7.4 per cent greater than during the corresponding week last year.

Commercial

Montana Company's Sales and Service Methods—Increasing Central-Station Revenue Through Appliance Sales

APPLIANCE SALES AND PROFITS IN WAR TIME.

New-Business Departments of Central Stations Must Look to Domestic Appliances for Large Share of Business.

In discussing the effect of the war on the new-business activities of central-station companies, R. M. Boykin and G. C. Sawyer in a paper before the recent convention of the Northwest Electric Light and Power Association presented the following observations in regard to appliance sales.

A principal line of activity should be appliance sales. The sale of appliances accomplishes two important things. It maintains the new-business department of an organization because it offers to the salesmen an opportunity to earn their salary on the sale of appliances and installing of additional outlets in the home alone, and it swells the company's revenue in kilowatt-hour sales. Never at any time in the history of the electric utilities has the opportunity for the sale of electric appliances been as propitious as it is today. The labor problem in the home has become so serious that the average housewife finds it incumbent upon her to perform many household duties that heretofore have been done by servants, and she is interested in being enabled to perform these duties with as little expenditure of time and effort as possible.

Electric appliances solve the problem for her in a very satisfactory manner and the results which electric utilities accomplish in the appliance line will be limited only by the effort that is put forth and by the educational work which is done by them in connection with the use of the appliances. The outlet campaign inaugurated by The Society for Electrical Development is a splendid plan and is in keeping with the idea of increasing the company's earnings through existing customers. It works in well with appliance campaigns, and by combining the two the utilities should be able to accomplish results warranting their retaining their new-business staff and adding to their merchandise and kilowatt-hour sales.

No Cut-Rate Sales.

This is the time when utilities which have heretofore favored the selling of appliances at less than list prices should by all means discontinue the practice. It is possible that this method of merchandising by central stations was at one time justified during the development of the various appliances when it was thought necessary to aid their introduction by quoting as low a price as was possible. This condition no longer exists in the same sense that it did years ago and the utility which persists in the practice is simply reducing its merchandising profits and is tending to demoralize the appliance market in its town.

We need all of the merchandise profit that we are legitimately entitled to and it is a fact that people expect to pay the going market price for all goods which they purchase. It may be claimed that cut price sales and campaign sales have been very successful, and the writers of this paper agree that this is apparently true. They believe, however, that had the same amount of effort been expended in advertising, solicitation, demonstration, etc., on standard appliances at regular list prices it is entirely probable that practically as many appliances would have been sold, and it is assured that the profit to the central stations would have been greatly increased.

MONTANA POWER COMPANY'S SALES AND SERVICE METHODS.

Sales on Commission Basis—Time Payments Limited to Six Months—Washer Sales Lead—Work of Maintenance and Extensions.

A brief review of the Montana Power Company's commercial activities, as reflected at its principal offices and store at Butte, discloses many well-informed plans and practices which demonstrate the effectiveness of its organized team work. The sales methods and service practice adopted contribute greatly to the central object in view, which is to make the business pay.

The Butte District, under the management of J. F. Roche, comprises the city of Butte, and 15 other towns, the company's commercial business therein consisting of furnishing light and power service and the sale of electrical appliances. The sale of power by this department, however, does not include the larger contracts with such heavy consumers as the mining and smelting companies and the railroads, those being handled through the office of F. M. Kerr, vice-president and general manager of the company.

In the disposal of light, power and appliances by the commercial department, the salesmen, while guaranteed a salary of $125 per month, have their compensation figured on a commission basis, which is straight 12 per cent, with lower commissions specified as follows: On an appliance sold at over $50, the commission is $6. On a sale from $100 to $150 a commission of $8 is paid; between $150 and $200, the commission is $12; between $200 and $300, the commission is $15. A salesman's compensation may exceed the guaranteed sum of $125 per month, and if his commissions continually fall below that figure he usually acknowledges his inability to come up to the standard and resigns. There are other specified commissions on motor contracts, window-display lighting and other service. The regulations serve not to encourage the salesman to load up the customer with appliances to an unreasonable degree; and the policy is to confine sales to those appliances which are deemed essential to economy under existing conditions.

As it is considered that war-time conditions do not warrant the giving of long-time credits, the rule here is that all payments be completed and the accounts closed at the end of six months. Prices are main-

tained, and these are based upon costs plus a fair margin of profit.

In this organization, the sales department and service department are kept separate, the former bearing its own expenses. The entire organization contributes to some extent to the service department. When a customer, anywhere, asks about matters pertaining to lighting, power, or appliances, or makes a complaint, the employe interviewed is not allowed to say anything like "I don't know, you'll have to see Jones about it." Instead, he is required to see that the customer is put in touch with the person whose duty it is to attend to the matter. Mr. Roche refuses to have such an institution as a "Complaint Department." But it is anyone's duty to see that inquiries or complaints are referred to the service department or elsewhere if necessary.

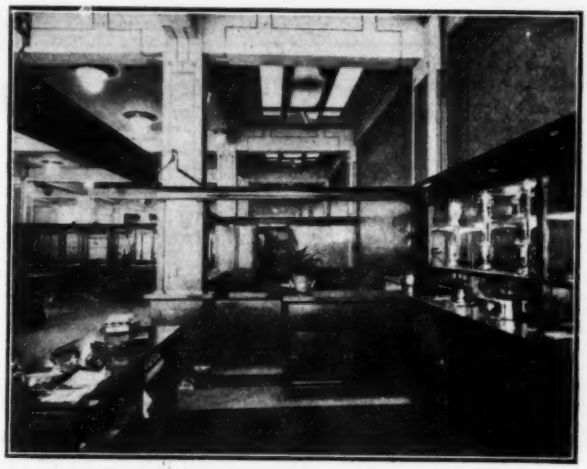
One of the fundamentals in Mr. Roche's business code, whether in the store, office, out on the line, or in the customer's home, is absolute courtesy. He observes this rule himself in his relations with employes and the public, and will tolerate no violations of it in his district. The best men are placed at the front to meet the public, and in the organization titles are not greatly accentuated.

Appliance sales for the first six months of 1918, compared with those of the similar period of 1917, show some interesting figures. This year the sale of washing machines has taken the lead, with a fair record on sewing machines, cooking ranges and vacuum cleaners. The increased sales are attributable to higher laundry charges and to the scarcity of domestic help. As to electric ranges, the sales are keeping up well, resulting in a net increase. In the territory in Montana, served by the Montana Power Co., about 2500 electric ranges are maintained in service.

The department of light and power distribution, construction and maintenance, comes under the supervision of the district manager, and is in direct charge of J. E. Davidson, superintendent. Since January 1 of this year, but few extensions have been made by the company, and those only to serve consumers who were within the required distance from the end of the distributing systems, as prescribed by the rules of the State Public Service Commission.

The repair shop and stock supply room are in the basement, below the store. By means of a card record system, accurately kept up, the receiving and outgo of all parts and material are shown daily. The rack classification of stock in this department is thorough and systematic.

Commercial Department, Montana Power Company, Butte. View of Main Lobby.



View Showing Electric Shop in Sales Department, Montana Power Company, Butte.

OVER 100 ISOLATED PLANTS ADOPT CENTRAL-STATION SERVICE IN NEW YORK.

During the first half of the present year, private generating plants in Manhattan, supplying installations of something more than 7000 hp. in motors and 65,000 incandescent lamps, were abandoned in favor of electric service from the Waterside stations of the New York Edison Co. The close-downs averaged more than six a month for the half-year period, and with those of the last half of 1917 bring the total to more than a hundred.

The mere figures should be a convincing argument of the advantages of central-station service. A study of the figures, which reveals the character of the properties affected makes the argument almost unanswerable. Practically every class of building in the city is found on the list. There are hotels, and apartment houses, office buildings and lofts, factories and breweries and an ice-making plant.

It is recognized that the more efficient generating equipment of the large central station requires less coal for a given output of electrical energy than the small isloated plant. In some instances the ratio is four to one. Multiply the fuel saving on each kilowatt-hour output of these hundred plants and the saving of coal in Manhattan, through the abandonment of private generating equipment during the past year, becomes a total of tremendous quantities.

"All of which," says the *Edison Monthly*, "is not only a very material advantage for the properties concerned, but is an important step in the vital problem of conservation of national resources."

NEW BUSINESS OF BYLLESBY PROPERTIES.

All electric properties of H. M. Byllesby & Company, reporting for the week ended September 14, show the following new business gains (net): 392 customers with 991 kw. of lighting and 162 hp. in motors. New business contracted for includes 1530 customers with 671 kw. of lighting and 1146 hp. in motors. There was an increase of 13.5 per cent in electric energy output over the corresponding week

Operating

Safeguarding Manhole Workers—Ceiling Support—Steam Pipe Covering—Effect of Dirty Coal—Pole Line Construction

PROTECTING CABLE SPLICERS IN MANHOLES.

Innovation by Cleveland Electric Illuminating Company.

Working in manholes is always bordering on the dangerous. There are dangers from above, there are dangers from cable breakdowns, of coming into contact with the wrong conductors which may be alive instead of dead that may cause electrocution, burns and injuries to the body from flashes. Gas from sewers and gas mains also often constitutes a source of danger from asphyxiation, to guard against which many companies supply their underground men with mechanically or manually driven blowers for exhausting the air and replenishing it with air fit to breathe.

The danger from a cable breaking down while a cable splicer is working on an adjacent one is a very real danger. That there are not more accidents is surprising. Quite recently a 12,000-volt cable broke down while three men were in a manhole working on an adjacent cable. The failure happened to occur in the manhole, the lead sheath rupturing and flame coming out that caused painful injuries to all three men.

To guard against this form of danger, the Cleveland Electric Illuminating Company equips its men that work in manholes with an asbestos hood that fits over the head, coming down over the shoulders so as to protect fully the neck. Special provision is made for vision and protection of the eyes from flashes, flame and flying particles. The men are also furnished rubber gloves, insulated pliers and a stool made of built-up dry wood mounted upon insulators. For working in manholes a portable lamp obtaining its energy from a portable storage battery is employed.

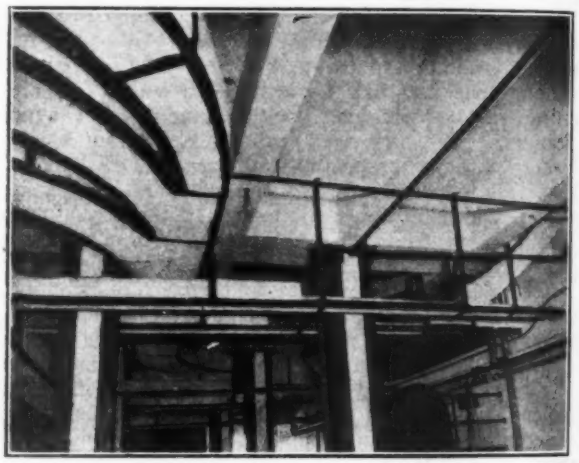
CEILING REPLACES FLOOR FOR CARRYING CABLES.

Ceiling Suspension Finding Favor for High-Voltage Cables.

In the majority of power plants using cambric or paper-insulated lead-covered cables it is the practice to install these cables in ducts of concrete, fiber or vitrified clay, or runways which are covered with concrete. As often as not one set of conductors is installed on top of another, the whole being cemented over, making the whole inaccessible in the extreme. And the location of these has been under the floor, where the whole is buried.

The complication, the difficulty of getting at one cable without interfering with or endangering men by one cable while working or attempting to work on some other one, that accompanied the above method have combined to encourage an entirely different method of routing cables through a power plant or substation. The tendency now seems to be to make the cable routing as simple as possible, and only enclose what it is absolutely necessary to enclose on the score of safety to the conductor or men in close proximity to it.

The accompanying illustration shows the method adopted in a large new power station recently constructed in the Middle West. There are four floors in this plant, with the feeders leaving from the third floor. The generator circuit breakers are on the first floor, generator bus on the second floor and the feeder breakers on the third floor. Where the cables could not be taken up vertically, but instead had to be carried horizontally, the interesting form of construction shown was adopted. This consists of a runway of concrete which in turn was supported from the ceiling by iron stirrups, as shown in the illustration, while iron



Method of Supporting Cables From Ceiling Instead of Burying Them Under the Floor.

channel is carried the entire length of the runway, to support the cable and runway as well as acting as an anchor for the stirrups supporting the whole structure.

This mode of construction is comparatively cheap, since easily carried out; in many cases considerable length of cable is saved, conductors are readily accessible and their presence does not add to the height of the building; the segregation of the various cables makes it practically impossible for trouble on one cable to be transmitted to adjacent cables, which are isolated one from the other.

METALLIC GUARDS FOR STEAM PIPE COVERING.

Inexpensive Method of Prolonging Life of Covering.

By Morris A. Damon.

All are agreed that it is important to cover all steam lines and hot-water pipes in steam plants so as to reduce radiation losses to a practical minimum. Asbestos or similar material is used for this purpose, which when applied is covered with canvas or similar protecting and supporting covering, because the heat insulating covering is comparatively delicate material.

Such pipe coverings pay for themselves and have long life if properly installed.

On the other hand, there are many places in a boiler room where it is difficult to keep the pipe coverings from being damaged by mechanical injury. For example, coverings over fire doors, over passages where material is brought in on trucks or carried over them by cranes, and so on, are liable to be damaged in course of time. One place where this is particularly liable to occur is along the sides of the boiler setting above the doors where the firemen use rods to break up clinker, break up a banked fire, etc.

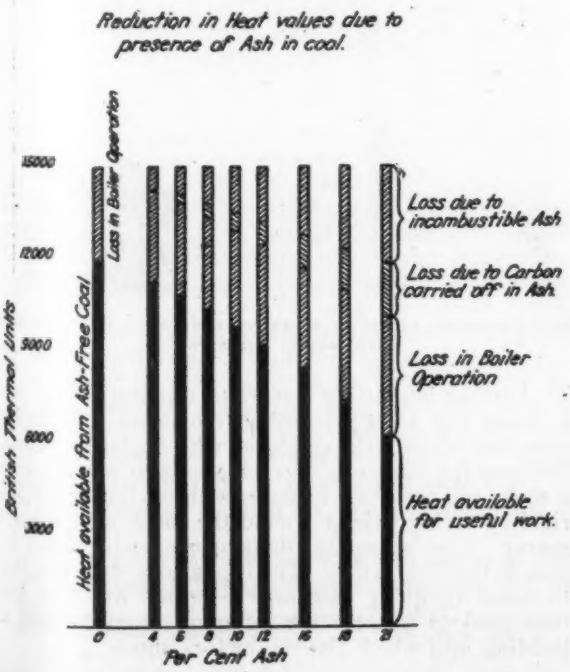
To overcome this it is a good policy to use an external metallic protective covering. After applying the asbestos and the canvas, install galvanized sheet iron around the pipe. These sheets may be 3 ft. or so in length and may be fastened around the pipe by soldering. The whole can then be painted and forgotten. The metallic covering prevents injury to the pipe covering and extends its life enormously, at the same time saving trouble and concern.

EFFECT OF DIRTY COAL.

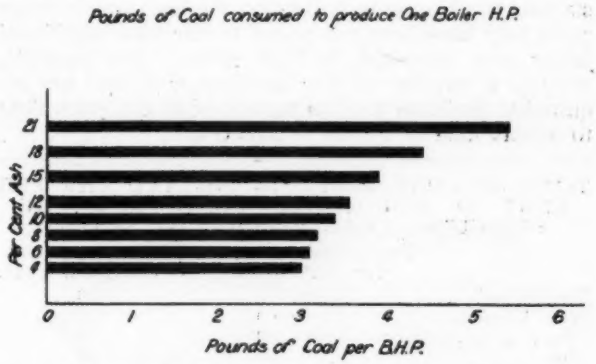
Influence of Ash Content on Combustion, Plant Performance and Transportation.

The presence of dirt and high ash content made itself very objectionable until the Government was eventually forced to adopt a clean-coal clause governing the sale and delivery of coal. The effect of dirty or high-ash coal upon thermal efficiency, boiler capacity, and transportation are briefly discussed in a report recently issued by the Engineering Committee of the National Research Council, and prepared free of charge by The J. G. White Engineering Corporation.

Reduction in Heating Value Due to the Presence of Ash.—The heating value per pound of combustible (i.e. ash and moisture-free coal) of all coals as a general average approximates 15,000 B. t. u. The variation in the heating value of coal is consequently largely due to the varying percentage of the ash,—the effect of moisture being less important except in a few cases of unusual moisture content. If an ash-free coal were obtainable, a heating value of about 15,000 B. t. u. per pound could be expected. The heating value by test of any commercial coal is reduced approximately in proportion to the increase in the percentage of ash, but its value as a heating agent is reduced more rapidly.



The percentage of ash has a distinct influence on the boiler efficiency. As the quantity of ash increases in percentage, it becomes more difficult for the fireman to completely burn the combustible. With a low percentage of ash and good firing we expect the ash removed from the boiler to contain approximately 25 per cent of its own weight of unconsumed combustible. As the percentage of ash increases, the percentage of combustible lost in the ash also increases very rapidly. With coal containing a high ash percentage, it is rarely possible to reduce the percentage of combustible in the ash to under 50 per cent of the weight of the ash.



This reduction in heat value is shown diagrammatically for varying percentages of ash in Fig. 1. The column at the left represents the heating value of ash-free coal, those at the right the relative values for coals containing varying percentages of ash. The upper stratum of each column represents the loss due to the fact that the ash is incombustible. The second stratum shows an additional loss due to the presence of unconsumed combustible contained in the ash taken from boiler grates. The next stratum represents the loss due to the fact that steam boilers cannot be operated at 100 per cent efficiency. The lowest stratum, therefore, represents the relative commercial values of coal containing varying percentages of ash.

Increase of Coal Consumption for a Given Power.—On the basis of chart in Fig. 1, the chart in Fig. 2 has been plotted. This shows the pounds of coal required to produce one boiler horsepower with coal of varying percentages of ash with careful operation. It will be noted that for the best coal with 4 per cent ash, there is required approximately 3 pounds of coal per boiler horsepower-hour, and that with 10 per cent ash, less than 3½ lb. is required. Beyond this point the increase is very rapid until for 21 per cent ash the coal consumption amounts to 5.45 pounds per boiler horsepower-hour or 80 per cent more than with 4 per cent ash and about 60 per cent more than with 10 per cent ash.

Influence of High Ash on Boiler Capacity.—The increase in the ash content of coal seriously reduces the capacity of steam boilers. The excessive quantity of coal required to deliver a horsepower with poor coal, shown in Fig. 2, makes it impossible to consume sufficient coal on the grate to deliver the necessary boiler horsepower. Central stations today are in a very serious condition because they find that their station load is increasing, but that the quality of coal has very much decreased, necessitating the operation of a larger

number of boilers. They find that whereas their boiler houses, two or three years ago, were of sufficient size to handle all ordinary increase in power demands, now, because of the poor quality of coal, they find it difficult to provide the steam necessary to carry the station load and impossible to operate their boilers at 200 per cent to 250 per cent of their rated capacity during peak periods. In the same stations it is now difficult to operate the boilers at more than 150 per cent to 160 per cent of their rating, and sometimes at even less. It is, therefore, necessary for these stations to place more boilers on the line, and in many cases they have been compelled to purchase additional boiler units at unusually high prices. For example, suppose a number of 500 horsepower boilers are required to generate 300,000 pounds of steam, equivalent to a peak load of 15,000 to 20,000 k.w.

TONS OF COAL MINED IN 1915 AND THE PER CENT OF ASH IN THE COAL FROM THE PRINCIPAL COAL PRODUCING STATES.

	Coal mined per annum Tons (2000 lbs.)	Average per cent of unavoidable ash.
Pennsylvania	158,000,000	9
West Virginia	77,000,000	7
Illinois	59,000,000	13
Ohio	22,500,000	10
Kentucky	21,400,000	9
Indiana	17,000,000	11
Alabama	15,000,000	12
Colorado	8,600,000	16
Virginia	8,100,000	8
Iowa	7,600,000	13
Kansas	6,800,000	13
Wyoming	6,500,000	6
Tennessee	5,700,000	15
Other States	29,500,000	12
Average for country		9.9

With coal containing 6 per cent ash or less eight boilers can be made to do this work. If the ash runs higher than 6 per cent nine boilers must be operated, above 10 per cent eleven boilers would be required, and above 18 per cent nineteen or twenty boilers are required. This situation is so bad that practically every large central station today has no spare boiler capacity, unless spare boilers have been purchased and installed within the past two years.

Increase in Transportation Equipment Due to High Ash.—There is a difference between preventable and non-preventable non-combustible in coal. The non-preventable ash is so thoroughly incorporated with the structure of the coal that it cannot be separated mechanically. This minimum ash content differs in each mine.

By preventable ash is meant the slate and other impurities which can be separated by careful preparation. This minimum ash varies from as low as 2 per cent in some cases to as high as 33 per cent in other cases. The average for the country is probably about 9 per cent or 10 per cent. The percentage of ash in the coal from various States, together with the output for the year 1915 is given in the table. Over half the coal mined shows an ash analysis of 9 per cent or better. The percentage for the country if averaged in proportion to each State's production is about 9.9 per cent. Ten per cent may be considered, therefore, as a fair average for clean coal for the entire country.

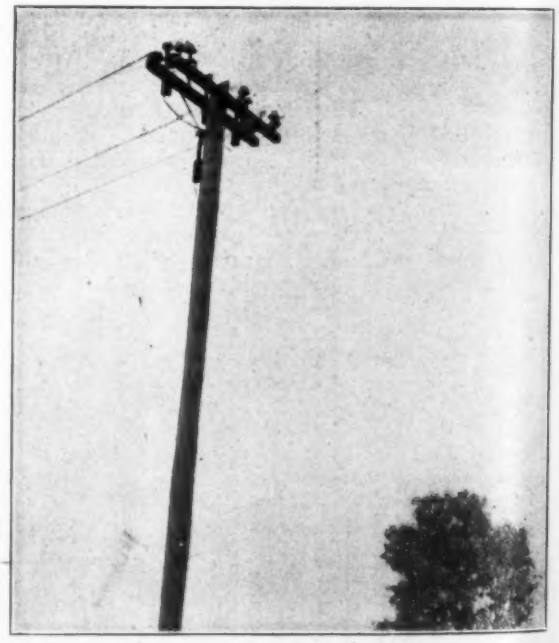
In the accompanying charts it will be noted that the trouble from ash is not excessive until 10 to 12 per cent content is passed. If, therefore, the percentage of ash can be limited to the average of 10 per cent transportation equipment would be reduced to a practical minimum; all boilers could be operated at a reasonable efficiency, and the number of boilers operated could be reduced to a little over one-half of the number required for the dirty coal (that is 18 per cent ash or over) besides making a saving in money that cannot be accurately estimated.

SPECIAL ARRANGEMENT OF ARRESTERS AND CHOKE COILS.

Choke Coil for Crossarm Mounting and Lightning Arresters Connected for 60 Per Cent Excess Voltage.

In equipping a 6600-volt transmission line, an Ohio central-station company found it impossible to obtain delivery of 6600-volt lightning arresters in time for use. A number of 2300-volt lightning arresters were obtainable, however, and it was decided to use these on the 6600-volt transmission line.

A voltage of 6600 volts between phases, which is the delta voltage, is equivalent to about 3800 volts star pressure between phase and ground or neutral. Connecting two arresters in series between phases is equivalent to a working voltage of 4000 volts, whereas the actual potential was 3800 volts, sufficiently close for all practical purposes, in an emergency in any case. The middle or neutral point of all arresters was tied in together, placing two arresters in series between phases, with an applied voltage of 3800. The middle point was then connected to another 2300-volt arrester which was connected to ground. The arrangement of all four arresters can be seen from the illustration.



Star-Connected Lightning Arresters and Choke Coils Mounted on Double Crossarm.

Another interesting feature of this installation was a choke coil installed on the crossarms. A double crossarm is seen to be employed with double insulators. Between the insulators on each crossarm was mounted a choke coil per phase in series with the line, and made rigid by string twined around the turns with a wood spacer. Unfortunately, these choke coils cannot be seen in the illustration. The choke coils were installed to assist lightning discharge over the arresters and thus tend to prevent the lightning from entering a building into which the conductors enter.

Contracting-Construction

Conduit Fishing Continued—New Ideas on Squirrel-Cage Rotors and Linemen's Comfort—Among the Contractors

A FEW FACTS ABOUT CONDUIT FISHING.

Discussion of Pressure Method of Fishing with Special and Improvised Equipment.

By Terrell Croft.

[This is the sixth of a series of seven articles by this well known author in which he describes and illustrates the best methods and equipment for fishing conduit. On account of the increasing use of conduit systems, this matter is steadily becoming more and more important, so that a discussion of the subject is of timely value.]

Pneumatic Fishing May Be Treated Under Two General Classifications:

(1) Pressure or plenum fishing.

(2) Vacuum fishing.

Pressure or plenum fishing is that where a piston, to which a fish line is attached, is impelled or forced through the conduit run by a pneumatic or air pressure behind it. The pressure is established by a force pump or obtained from a compressed-air system. Vacuum

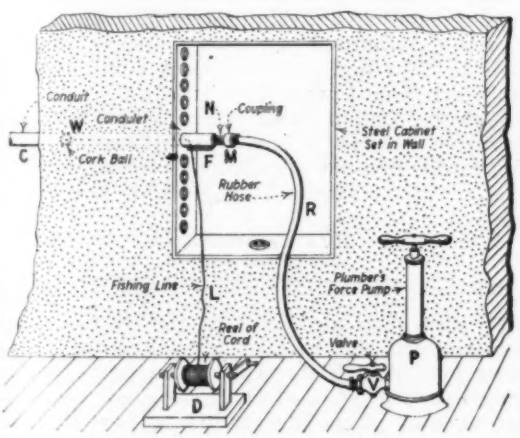


Fig. 22.—Pneumatic Pressure Fishing Using Cord-Feeding Fitting F.

fishing is that where the piston (to which a fish line is fastened) is pulled or "sucked" through the conduit by a partial vacuum created at the far outlet, by a suitable vacuum pump. The principles and methods involved will be described in paragraphs which follow.

The Principle of Pneumatic Pressure Fishing may be understood from a consideration of Fig. 22 (see also Fig. 1*). The air pressure is created by the pump *P*, which is connected with the rubber hose *R* to the conduit *C*, that is being fished. Due to the pressure developed by *P*, a piston *W*, which fits loosely within the conduit and to which the fishing line *L* is attached, is forced through the conduit from outlet to outlet.

The piston is preferably a cork ball, shown as *B* in Fig. 23, having a hole through it to provide for the attachment of the fishing line *L*. Or it may, in an emergency, be a wad of cloth *W* (Fig. 24). Where a cork ball is used, its diameter should be such that it will just pass readily through the straight conduit and around elbows. Before forcing such a ball piston through an actual conduit run, it should first be pulled through an elbow held in the hand to insure that it

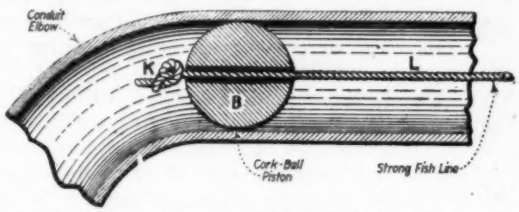


Fig. 23.—Cork-Ball Piston on End of Fish Line for Pneumatic Fishing.

will pass without difficulty. Such a ball can be whittled from a large cork with a very sharp knife. However, a much better and smoother product can be produced on a high-speed lathe.

The hole, through the center for the cord, should be burned with a piece of red-hot wire of proper diameter. A knot, *K* in Fig. 23, carefully tied in the end of the pulling-in line will insure its attachment to the ball. This knot should have no long loose ends because if it has they may catch in joints in the conduit and interfere with the operation of the device.

An Important Advantage of the Pneumatic Fishing Method Is That It Cleans the Ducts of Minor Obstructions. Chips, particles of dirt, plastering, pieces of cord, and even brads and nails somehow or other get into the ducts in buildings under construction. These particles may, unless removed, foul the conductors which are being pulled into the duct. Where the pneumatic method of fishing is employed, these small particles are blown out at the same time the fishing cord is forced through. The removal of

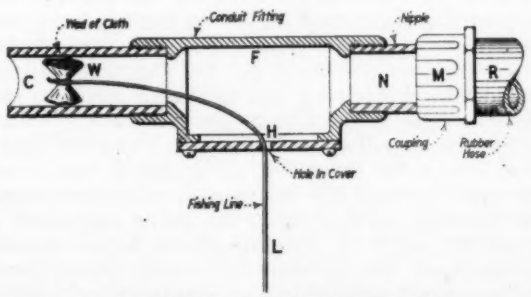


Fig. 24.—Details of Cord-Feeding Fitting.

more serious obstructions was discussed in the second article of this series (Electrical Review, August 31, 1918).

The Cord for the Fishing Line for pressure fishing should be of the strongest material available. The

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*See Electrical Review, August 24, 1918, page 303.

best cord for this purpose is a high-grade angling line which may be purchased at a sporting-goods store. If an angling line cannot be obtained, a chalk line such as is used by masons and carpenters can, as a substitute, be utilized. Where the run is short, a line sufficiently heavy so that it may be used for a pulling-in line for the conductors can sometimes be forced through the duct. But where the run is long and has many turns, it does not pay to endeavor to force through a heavy line with a force pump. In such cases, a light but very strong line should be impelled through and then, with this, a stronger pulling-in line can be drawn in.

A Home-Made Outfit for Pressure Fishing is detailed in Figs. 22, 24 and 25. The pump *P* (Fig. 22) is a plumber's force pump of the type regularly manufactured by plumbing supply houses. The enlarged cylindrical portion at the base constitutes a reservoir so that a considerable pressure may be developed before the valve *V* is opened. The rubber hose *R* (Figs. 22 and 24) has on its upper end a coupling *M*, which screws on a nipple *N* connecting it to the "cord-feeding fitting," which is detailed in Fig. 24. This fitting is merely a side-outlet conduit fitting (*F*, Fig. 24) through the closed metal cover of which a small hole *H* is drilled to provide for the admission of the fishing line *L*. The nipple *N* is screwed into one end of *F* so that the coupling *M* on the end of the pump hose can be attached. *W* is the wad of cloth on the end of the fishing line which, in this case, constitutes the piston; a cork ball like that of *B*, Fig. 23, would be preferable. *C* is the conduit to be fished.

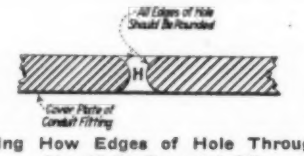


Fig. 25.—Showing How Edges of Hole Through Cover Plate Should Be Rounded Off.

In Using a Pneumatic-Pressure Fishing Outfit such as the one shown in Fig. 22, the first step is to screw the cord-feeding fitting *F* (without its cover being in place) onto the end of the conduit to be fished and to connect to it the pressure hose *R*. Then the fishing line *L* is passed through the hole *H* (Figs. 24 and 25) in the cover plate. The piston *W* is attached and pushed to within the conduit and the covering plate is clamped to the fitting. Then sufficient cord to extend entirely through the run is pulled from the reel *D* (Fig. 22) and laid in loose coils upon the floor. Valve *V* is closed and the handle of the pump is operated until a reasonably high pressure has been developed in the reservoir. Now valve *V* is opened and if things are operating properly, the piston *W* should be forced entirely through the run from outlet to outlet and should carry the fishing line *L* with it. With the fishing line, a pulling-in line can be drawn through the tube. Note that the reel *D* (Fig. 22) is used to wind the cord on when it is not in use, to prevent tangling and breaking of this line. As above suggested, just before the line is forced through the tube it should be uncoiled and laid in loose coils on the floor, because the pressure developed by the pump may be insufficient to unwind the reel in addition to forcing the piston and fishing line along the duct.

An Improvised Pressure Fishing Outfit is shown in Fig. 26. With this method a cloth or cork piston is provided on the end of the fishing line. However, instead of the fishing line being laid on the floor and from there being pulled into the duct, enough of it is initially placed in the end of the duct, as shown in Fig. 26, to extend from outlet to outlet. When the hose *H* is placed against the end of the conduit and the pressure from the pump released, the piston will, under favorable conditions, be forced through the conduit and will carry the fishing line with it. The disadvantage of this method lies in the fact that the coils of cord placed within the end of the conduit sometimes tangle and knot, preventing the effective threading of the tube. To obviate this difficulty, a round hole can be burned with a red-hot needle or wire in the upper end of the hose (*H*, Fig. 26) to provide for the admission of the fishing line. Where this is done, the hole thus burned performs the same function as the hole *H* in Fig. 24. However, considerable friction, which tends to retard the free passage of the cord through the conduit, is developed at the hole through the rubber through which the cord passes. It is for this reason that the practically frictionless hole in a metal cover, as shown in Fig. 24, is decidedly preferable.

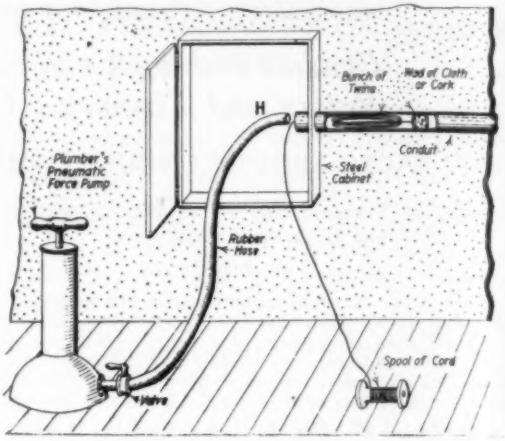


Fig. 26.—Pneumatic Fishing With Improvised Outfit.

(To be continued)

BUILDING SQUIRREL-CAGE ROTORS.

A novel method of making the electrical connections between the bars of a squirrel-cage rotor is shown in United States Patent No. 1,275,687, as recently issued to Wilfred D. Hodson, of Akron, Ohio. The inventor places the conducting bars in the slots of the laminated core, suitably insulating them from the core, and splits the ends of each bar into a substantially T-shaped form as shown in our illustration. He then deposits a ring of metal electrolytically over these ends, as shown in dotted lines, thus obtaining a jointless connection of high electrical and mechanical efficiency.

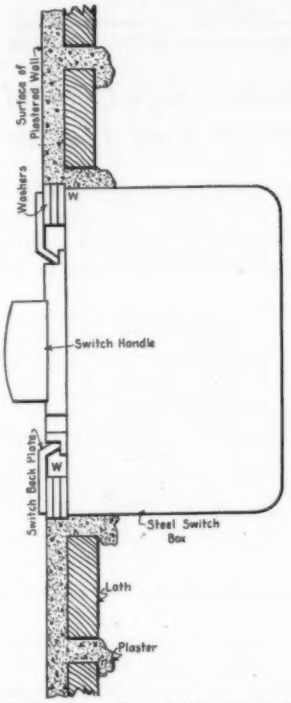
Building Squirrel-Cage Rotors.

WASHERS FOR ALINING SWITCH MOVEMENT.

By C. M. CHARLAND.

Experience has shown that it is practically impossible to so locate switch boxes or other steel outlet boxes that they will lie accurately flush with the sur-

face of the plaster after the plaster has been put on. The reason is that the plasterers will put on a thick coat when a thin one is expected, and vice versa. Therefore, if the boxes are set back, rather than for-

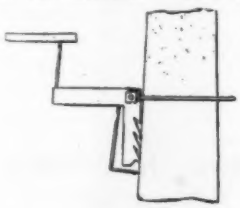


Use of Washers for Lining-up Switch.

ward, and shims or iron washers (*W* in the sketch above) are used after the plaster is on the switch, the movement will beb rought out where it belongs. Some of the switch manufacturers furnish a few of these washers in the box with every switch that they produce and place on the market.

LINEMAN'S SEAT.

An interesting support for a lineman's seat is shown in the accompanying cut, taken from United States Patent No. 1,275,392 to Dan Collins, of Baker, Ore. He mounts the seat on a frame carrying rigid saw teeth which extend downwardly, and swings



Supporting a Lineman's Seat.

these teeth against the pole by grab-hooks pivoted to the frame.

AMONG THE CONTRACTORS.

The Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded a contract to Harry Alexander, Inc., 20 West Thirty-fourth street, New York City, for the installation of a new flood-lighting system in the Constable Hook section at Bayonne, N. J., to cost about $18,000.

W. H. Roeller & Company, Pottstown, Pa., will do the electrical work in the new apartment building now in course of erection at King and Hanover streets, in that city.

The H. F. Farroy Company, 11 Austin street, Cambridge, Mass., will do the wiring and other electrical work in two residences to be erected on Oak Square, Boston.

The Electrical Equipment Company, 16 North Ohio avenue, Atlantic City, N. J., will do the electrical work in connection with the improvements to be made at the Ocean City high school.

The Connor Electric Company, 258 Washington street, Boston, Mass., is doing the electrical work in the new two-story and basement male infirmary building now in course of erection in the Mattapan district.

A manual training shop building is to be built for the Central High School at Cleveland, Ohio, at a total cost of over $70,000. The electric wiring and installation of motors will be done by the electrical contracting firm of G. W. Malone, 726 Marion Building, at a contract price of $5,516.

The Coghlin Electric Company, Main street, Worcester, Mass., will do the electric wiring in the new plant being built at Worcester by the United States Light & Heat Corporation, Niagara Falls, N. Y. This plant will cost about $50,000.

The United Electric Construction Company, 1727 Sansom street, Philadelphia, Pa., has received a contract for electrical work in the new housing development of the Chester Shipbuilding Company, Chester, Pa., to cost over $1,300,000. The work will consist of 314 two-story houses, three-story dormitory, hotel and restaurant buildings.

The Department of Public Works of Trenton, N. J., has awarded a contract to Harry E. Stahl, Goodwill Place, Trenton, for the construction of new electric pumping stations for the municipal waterworks, to cost $150,000. The actual signing of the contract has been held pending owing to an objection entered by the DeLaval Steam Turbine Company holding that the company was barred from submitting a bid owing to the nature of the specifications.

R. W. Thompson and W. A. Castleton, Seattle, Wash., have organized a company to engage in electrical work, which will consist of installing, rebuilding and selling electrical equipment for hydroelectric and industrial plants. Mr. Thompson, formerly vice-president and superintendent of A. H. Cox & Company, is an electrical engineer, and acts in that capacity for several companies having electrical work in hand. Mr. Castleton was formerly engaged in mining at Helena. Thompson & Castleton are overhauling equipment in the mill of the Ferry-Baker Lumber Company, at Everett, Wash., the improvements costing $5000. A part of this work consists of installing oil switches in all feeder circuits. This company operates a 1000-kilowatt turbogenerator for producing its own power. Another installation being made by this contracting firm consists of a new General Electric 750-kilowatt steam turbine, for the Morrison Mill Company at Bellingham, replacing a reciprocating steam engine. They are also rewinding a 900-horsepower motor for use on one of the hydraulic dredges of the Puget Sound Bridge & Dredging Company, and have sold two 50-horsepower motors to be installed in the plant of the Washington Excelsior Company.

New Appliances

Prismatic Glass Industrial Lighting Reflector—Safe Control Pedestal for Induction Motors—Improved Tool Holder

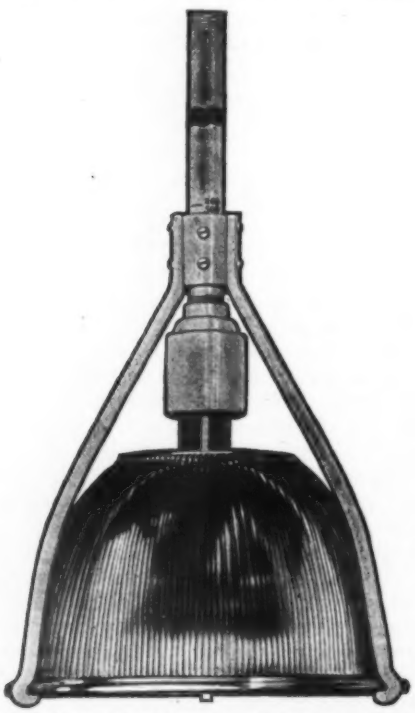
NEW HOLOPHANE INDUSTRIAL LIGHTING UNIT.

In line with the requirements of the War Industries Board, that manufacturers in their designs are to eliminate the multiplicity of sizes and shapes, the Holophane Glass Company, 340 Madison avenue, New York City, has placed on the market an industrial lighting unit which has many new and practical features.

This unit is made in two types to produce the extensive and the intensive distribution of light. Two sizes of units are made to accommodate all type C Mazda lamp sizes from 75 to 500 watts. The correct lamp position for each is obtained by a simple adjustment to the sliding collar, the stem being calibrated for the various lamp sizes.

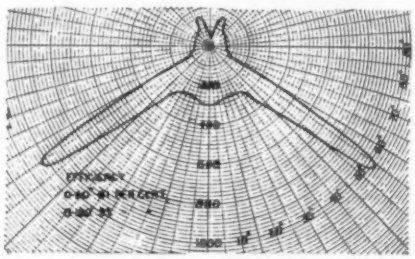
The holder is designed on the ice-hook principle—the stronger the pull the harder the grip, and the reflector may be removed for cleaning without removing the lamp bulb.

The distribution curves have been predetermined to give uniform illumination, high illumination on vertical surfaces and absence of glare. The remarkably high efficiencies of 93 per cent in the 0-180-degree zone and 61 per cent in the 0-60-degree zone are obtained.

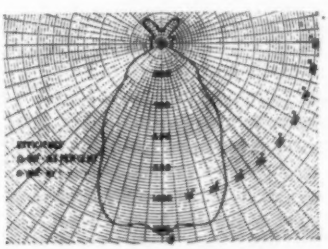


Holophane Industrial Lighting Unit, Which Provides for Lamps from 75 to 500 Watts by an Adjustment to the Sliding Collar.

Some of the advantages claimed for this unit are: High efficiency, absence of glare, high illumination on vertical surfaces, ease of cleaning, freedom from deterioration, softening of shadows, mechanical strength, simplicity, shielding of the light source, low brightness of inside lower edge of reflector, some light given to the ceiling, only two sizes of units for all lamp sizes from 75 to 500 watts, holder designed on the ice-hook principle, may be removed for cleaning without removing the lamp, uniform illumination between units, complete and ready to install.



Photometric Distribution Curve of the Extensive Type Reflector.



Photometric Distribution Curve of the Intensive Type Reflector.

"Scientific Industrial Illumination" is the title of a 36-page illustrated book, issued by the Holophane Glass Company, discussing this new unit and its application.

"SAFETY-FIRST" INDUCTION-MOTOR PEDESTAL.

Happily, in manufacturing operations, safety and efficiency are so related that an improvement in either usually effects an improvement in the other. More and better work is produced when light, air, sanitation and disposition of machinery are such that working conditions are pleasant and healthful, and comparative freedom from liability to occupational or accident disability exists.

In connection with the requirements of safety the panel illustrated in Fig. 1 is of considerable interest. It is adapted particularly to the control of alternating-current feeder or motor circuits in capacities up to the rating of the General Electric type FK-20 oil circuit-breaker, namely, 300 amperes and 2500 volts.

By referring to Fig. 2, it can be seen that the unit consists of a type FK-20 oil circuit-breaker mounted on a pedestal constructed of steel plates and angle iron, the former holding the latter in position and serving as mounting for the apparatus in the interior of the pedestal. The compartment immediately beneath the breaker and surrounded by the steel plates is used for mounting the potential and current transformers. The space above the switch serves as a housing for the disconnecting switch, and also provides a location for either voltmeter or ammeter or both when desirable. Other instruments such as watt-hour meters, etc., may be mounted on the sheet-steel front of the panel. The back of the pedestal is also a sheet-steel plate removable to allow access to the interior.

The voltmeter and ammeter are mounted on a cast base above the breaker, and with the front edges of the instruments flush with the casting. Back of the instruments in the interior of the housing are spring contacts which make contact with the instrument studs, so that after removing the holding screws the instruments can be removed from their supports without disconnecting the leads. When the instruments are replaced, the connections to them are made automatically. The instrument resistances are mounted behind the instruments.

The watt-hour meter is mounted on the lower front of the pedestal. The studs run through insulating bushings to the interior, where they are connected to the leads from the current and potential transformers which are mounted on strap-iron supports connecting the angle-iron uprights. The drilling of the supports permits mounting either one or two current and potential transformers without additional drilling.

The oil circuit-breaker is operated in the usual manner by an iron handle from the front. Automatic protection is obtained by two series overload coils provided with dashpot time-limit trip. The undervoltage-release weight hangs in a small space. The oil circuit-breaker can be operated only when the disconnecting switch is closed. This latter switch is operated from the front of the pedestal by a removable handle so interlocked with the oil circuit-breaker that the disconnecting switch can be operated only when the breaker is open.

Fig. 1.—"Safety First" Pedestal for 2300-Volt Induction Motor.

The breaker can thus be cut out of service at any time when open, and can be inspected or repaired without danger. The oil tank cannot be taken off the breaker nor can the cover over the disconnecting switch be removed unless the disconnecting switch is open.

The disconnecting switch and the oil circuit-breaker can both be locked open by removing the disconnecting-switch handle. This handle can be removed or attached only when the disconnecting switch is open.

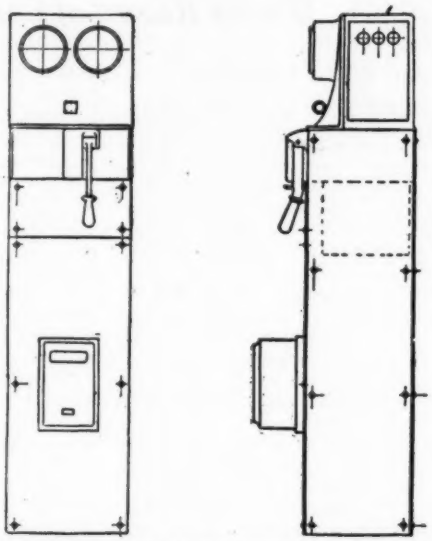


Fig. 2.—Front and Side Elevations of Pedestal.

It is impossible to get at the live parts of any of the apparatus until portions of either the back or the front of the pedestal have been removed.

The panels occupy small space and are easy to install. Pedestal-type units are designed for single or group mounting and have a large bus compartment just above the disconnecting switch and inside the cast-iron housing. Connections run either to top or bottom of the pedestal, but as a rule the leads enter from the bottom, as this is generally the more convenient arrangement. After being put in place the pedestals are secured by bolting to the floor.

CLEVELAND-NATIONAL SPRING-HEAD TOOL HOLDER.

A new form of tool holder has recently been placed on the market by The Cleveland National Machine Co., Cleveland, Ohio. The tool holder embodies a spring head for relieving chatter and enabling a perfectly smooth cut to be obtained. The head can be adjusted right or left for any angle up to 90°. The spring is so designed that if set on center the tool cannot dig into the metal being cut. This spring has sufficient strength to stand up to all finishing work ordinarily done by a lathe taking a ½ by 1 1/16-in. shank.

Three tool clamps are furnished with each tool holder, all interchangeable, permitting quick setting or change of tools. This tool, which comprises the spring head and interchangeable invertible tool clamp, is made of forged tempered steel, polished and of highest grade workmanship. The Cleveland-National tool holder does not eliminate rigid tool holders, but for fine work it operates smoother and gives a perfect finish.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

CLAREMONT, N. H.—The Town Council is planning for the installation of a number of new street lights in the electric street-lighting system. Electric energy for operation is supplied by the Claremont Power Company, which has been granted an increase of 25 per cent per month for this service.

PEPPERELL, MASS.—Nashua River Paper Company has awarded a contract for the construction of a hydro-electric power house at its works at East Pepperell. The L. H. Shattuck Company, Granite street, Manchester, N. H., is the contractor.

TAUNTON, MASS.—Taunton Knitting Company, 97 Ingell street, has commenced the construction of a one-story addition to the boiler plant at its works. The structure is estimated to cost about $5,000. Franklin D. Williams, 50 Weir street, is the building contractor.

BROOKLYN, N. Y.—The Navy Department has established what is said to be the highest radio aerial in the world at the local navy yards, taking the form of a wireless system on a captive balloon. The station is in constant service with communication in this country as far west as Arcadia, Cal.

GALWAY, N. Y.—The Board of Supervisors of Saratoga County has awarded a contract for the erection of a new extension to the power plant at the County Tuberculosis hospital. The structure is estimated to cost $12,000. J. Tittemore, Galway, is the contractor.

ROCKAWAY, L. I., N. Y.—The United States Government, Bureau of Yards and Docks, has awarded a contract for the construction of a new radio building at the local Government station to cost $11,896. David Hill, Ozone Park, N. Y., is the contractor.

NEW YORK, N. Y.—The New York Building Managers' Association has taken initial steps providing for the installation of meters to record the amount of electric energy consumed by tenants in the various office buildings of the city, and placing an equitable charge for the current used. It is held that there is an enormous waste of electric energy fostered by the present system of furnishing free electric current, and that a considerable saving of fuel will be evidenced should the plan be placed into effect.

CAMDEN, N. J.—Public Service Railway Company has taken out a building permit for the construction of an administration building at the new terminal at Broadway and Morgan street, directly opposite the plant of the New York Shipbuilding Corporation.

CAPE MAY, N. J.—The United States Government, Bureau of Yards and Docks, has had plans prepared (Specification 3408), for the erection of a power house at the local Government station to cost about $67,000.

DOVER, N. J.—New Jersey Power & Light Company has completed improvements in one of its 3500-k. w. units at the new plant, and operations have been inaugurated.

NEWARK, N. J.—General Electric Company, Schenectady, N. Y., has awarded a contract for the construction of a one-story brick addition to the power plant at its local works at Boyd street and 17th avenue, to cost about $9,000. The Salmond Brothers Company, 526 Elm street, Arlington, is the contractor.

NEWARK, N. J.—Instant Electric Vaporizer Company has filed notice of authorization to operate a plant at 52 Grove street, Irvington, for the manufacture of electric vaporizers. Frank F. Jackson, 52 Grove street, heads the company.

NEWARK, N. J.—J. Wiss & Sons Company, 31 Littleton avenue, have had plans prepared for alterations and improvements in the boiler plant at their works, to cost $3,455.

ORANGE, N. J.—In connection with the ordinance recently passed granting a franchise to the Western Union Telegraph Company to install a new electric conduit system in Essex avenue, between Main street and Lackawanna Plaza, it has been decided to postpone the work temporarily because of the possibility of relocating the offices of the company.

TRENTON, N. J.—The City Commission has awarded a contract for the installation of two new electrically-operated centrifugal pumps and two electrical motors with automatic controls at the municipal water works. The William R. Thropp & Sons Company, Trenton, is the contractor.

ALTOONA, PA.—The Pennsylvania Railroad will spend $2,000,000 in establishing a central electric power plant and in extensions in the Juniata shops to increase the output of locomotives. Materials and equipment have been ordered and work will begin at once.

PHILADELPHIA, PA.—Contract has been let by the Barrett Manufacturing Company to the O'Meara Construction Company, 253 South Quincy street, Philadelphia, for the erection of the proposed one-story boiler plant, about 59x84 feet, at Bermuda and Margaret street. The structure is estimated to cost $50,000.

PHILADELPHIA, PA.—The United States Government, Bureau of Yards and Docks, has had plans prepared for the erection of an electric shop (Specification 3420), at the local navy yards in connection with other shop structures.

PHILADELPHIA, PA.—Plans have been completed by the Delaware Storage & Freezing Company, American and Callowhill streets, for alterations and improvements in its engine plant.

PHILADELPHIA, PA.—Bennett & Aspden Company, Krams avenue, has awarded a contract to the William Steele & Sons Company, 30 South 15th street, Philadelphia, for the erection of the proposed addition to its power plant, about 15x45 feet in size.

PHILADELPHIA, PA.—The Public Service Commission has granted approval to the contract between the Philadelphia Rapid Transit Company and the United States Housing Commission whereby the Government, through the Commission will advance a loan of $1,740,000 to the Philadelphia company for extensions in its transit facilities. Ninety additional cars will be purchased and extensions and additions made to the various substations, etc.

PITTSBURGH, PA.—Receivers of the Pittsburgh Railway Company have made arrangements to appear before the United States Court to request authority to expend a sum approximating $1,000,000 to be used for extensive improvements in its equipment and rolling stock.

PITTSBURGH, PA.—Following the request of the local fuel administration to the general public to conserve electric light and power during the hours of 7:30 and 10 a. m., a total of 11,000 k. w. was conserved in one day. The request has been made in order to relieve the "peak" load of munitions, coal and other war essential industries in the Pittsburgh district.

WILKES-BARRE, PA. — Wilkes-Barre Company, furnishing electric and gas service in Wilkes-Barre and vicinity, has filed notice with the Public Service Commission of an increase in its capital from $2,310,000 to $2,318,000, for extensions.

WASHINGTON, D. C.—The Bureau of Standards has awarded a contract to the Turner Construction Company, 242 Madison avenue, New York, for the erection of a two-story reinforced-concrete dynamometer building, about 50x150 feet in size.

WASHINGTON, D. C.—The War Department is having plans prepared for the construction of a power house and laundry building at Camp Meigs, near Washington, to cost approximately $150,000.

WASHINGTON, D. C.—The emergency power bill, recently introduced, providing for a fund of $175,000,000 for the construction of new electric power plants and extensions to existing stations, and authorizing Government control and centralization of power plants, has been approved by the House Interstate Commerce Committee.

SALTVILLE, VA.—In connection with the construction of the proposed

new Government plant for the manufacture of gas bombs, plans have been prepared for the erection of a power plant for operation.

SHELBY, N. C.—In connection with the new knitting mill to be established by Charles A. Morrison, to be known as the Emma Hosiery Mills, electric machinery for operation will be installed.

ST. PAULS, N. C.—St. Pauls Cotton Mills have had plans prepared for the changing of its motive power from steam to electricity.

WILMINGTON, N. C.—An expenditure of $400,000 will be undertaken by the Tidewater Power Company for improving its transportation and electric-power generating facilities.

CHERAW, S. C.—Pee Dee Knitting Mills, recently incorporated with a capital of $100,000, has acquired a new factory building and is planning for the immediate installation of necessary machinery, including electric equipment for operation. Robert Chapman is president and treasurer.

ATLANTA, GA.—Nunnally Candy Company will purchase electrical equipment.

ATLANTA, GA.—Northeast Electric Company is said to be considering the installation of new equipment at 55 West Peachtree street for the establishment of a new branch plant for the manufacture of electrical supplies, etc.

COLUMBUS, GA.—G. K. Hutchins is in market for a 400-k. w. generator.

JACKSON, GA.—Citizens Ice & Cold Storage Company will purchase electrical equipment. W. C. Merck, manager.

NORTH CENTRAL STATES.

AKRON, OHIO.—Safety Director C. W. Beaum, has petitioned the Capital Issues Commission for authority to expend $50,000 improving the fire and police signal system.

CAMBRIDGE, OHIO.—Cambridge Home Telephone Company has increased its capital from $100,000 to $175,000. Improvements will be made.

CINCINNATI, OHIO.—The Capital Issues Committee has approved of an issue of $80,000 worth of Rapid Transit bonds. Address City Clerk.

SALEM, OHIO.—Service Director Conners is in favor of the purchase of one triple pump for $6,000, three deep well pumps for $4,500 and one motor-driven air compressor for the Garfield wells for $1,500; the whole installation not to exceed $15,000. The council decided to meet with local electrical and engineering experts to consider it.

ANDERSON, IND.—The Anderson Board of Public Works has announced that a contract has been let to the Hatfield Electric Company, Indianapolis, Ind., for three boilers and stokers for the city electric plant, to cost $94,400.

FORT WAYNE, IND.—The power house of the Fort Wayne & Northern Indiana Traction Company was damaged by fire. Loss $80,000.

NEW ALBANY, IND.—A threatened strike of conductors and motormen of the Louisville & Southern Indiana Traction Company and the Louisville & Northern Railway Company, operating interurban lines between New Albany and Jeffersonville, Ind., and running into Louisville, Ky., did not materialize, a truce having been declared. The companies had refused to sign a contract giving the men 40 to 45 cents an hour for city service and 45 to 50 cents an hour for interurban service, with provision for an eight hour day, but agreed to make an increase of one cent an hour, making an increase of 13 cents since April 1, or 33 to 39 cents an hour for interurban service and 31 to 36 cents an hour for city service. The men stated that they were not satisfied with the compromise and that they would carry their appeal to the War Labor Board in Washington.

DATES AHEAD.

American Electrochemical Society. Fall meeting, Princeton, N. J. Secretary, Prof. J. W. Richards, Lehigh University, Bethlehem, Pa.

American Electric Railway Association. Annual meeting, Atlantic City, N. J., October 8 and 9. Secretary, E. B. Burritt, 8 West 40th street, New York City.

Illuminating Engineering Society. Annual convention, New York City, October 10. General secretary, Clarence L. Law, Irving place and 15th street, New York, N. Y.

Jovian Order. Annual convention, Dallas, Texas, October 24-25-26. Mercury, Ell C. Bennett, 1415 Syndicate Trust building, St. Louis, Mo.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kans.

ALTON, ILL.—Alton, Granite & St. Louis Railway Company, claiming that the company is operating at a loss, has filed injunction proceedings in the St. Clair County Circuit Court, Belleville, Ill., to prevent the Illinois Public Utilities Commission from enforcing the two-cent passenger rate law.

JOLIET, ILL.—The Illinois Public Utilities Commission has granted the Joliet & Eastern Traction Company an increase in passenger and freight rates to conform with other rates charged by carriers engaged in like service in the territory of the company. The order was effective September 16, and will continue until six months after the termination of the war.

PEORIA, ILL. — As a war-time economy measure the Peoria Railway Terminal Company's electric line between Peoria and Pekin, on the east side of the Illinois river, has been united with the management of the Peoria and Pekin Railroad Company, a steam road. It is said that the motive power of the Peoria Railway Terminal, under the new management, will be changed from electricity to steam, provided certain problems can be worked out.

PONTIAC, ILL.—Steps will be taken soon to dispose of the physical property of the Bloomington, Pontiac and Joliet Traction Company, operating between Pontiac and Dwight. The property is bonded for $300,000 and the Public Service Company of Northern Illinois owns $200,000 of the bonds. At the present time the road is earning only operating expenses and cannot meet interest charges on the bonds.

SPRINGFIELD, ILL.—An increase in interstate passenger rates from two to two and one-half cents has been granted by the Interstate Commerce Commission. While denying the petition of the company for an increase of 25 per cent, which would make the fares of the company on par with those of the steam railways of the country, the Interstate Commerce Commission has granted the increase of 25 per cent in freight rates. The traction company has been instructed to prepare the customary 30 days notice of the increase in tariffs.

FARIBAULT, MINN.—A new milk condensery at Faribault is being served by the Northern States Power Company, power requirements being 100 h. p.

MANKATO, MINN.—The Christiansen mill at Madelia has been connected to the lines of the Northern States Power Company, and will be supplied electrical energy to the extent of 450-hp. in motors by the Northern States Company. The mill has a capacity of 800 bbls.

DAVENPORT, IOWA.—The Tri-City Railway Company and the Moline, Rock Island & Eastern Traction Company, which filed a petition with the Illinois Public Utilities Commission for authority to increase rates for street car service in Rock Island, Moline, East Moline and Silvis from five cents to seven cents, have been notified that the proposed increase has been ordered suspended until January 29, 1919.

KENNETT, MO.—Gideon-Anderson Lumber Company, will purchase an electric light plant. Address O. B. Gwyn, superintendent.

BUFFALO, KANS.—B. Rollins & Company, Engineers, Railways building, Kansas City, Mo., have completed plans for a $20,000 electric light plant. Bonds have been voted. Address Arthur Puckett, city clerk.

COLONY, KANS.—The electric light plant was totally destroyed by fire recently.

PERU, KANS.—$25,000 will be expended for improving light and water plant. Engineers Archer & Stevens, 609 New England building, Kansas City, Mo., have prepared plans. Address Fred Mallonee, city clerk.

SOUTH CENTRAL STATES.

CHATTANOOGA, TENN.—County Judge W. A. Conner recommended the building of a separate lighting plant for the county.

FORT PAYNE, ALA.—The city has voted $6,000 in bonds to construct an electric light plant. Address the mayor.

SHREVEPORT, LA. — Standard Electrode Company, with headquarters in the Ward building, recently organized, is considering plans for the establishment of a new plant and laboratory for the manufacture of electrodes. James Kelly, New Orleans, is president of the company.

DUNCAN, OKLA.—A $50,000 bond issue for waterworks improvements, $50,000 for sewer, and $30,000 for power plant, carried.

MENO, OKLA. — Public Service Company of Muskogee has been granted franchise to construct and operate an electric light and power system in this city.

WESTERN STATES.

SEATTLE, WASH.—Formal notice of the acceptance of the city's offer to purchase the street car lines of the Puget Sound Traction, Light & Power Company for the sum of $15,000,000 payable in utility bonds, was filed with the city council by President A. W. Leonard.

SEATTLE, WASH.—An ordinance has been introduced appropriating $10,000 to complete the city substation at Ballard.

SEATTLE, WASH. — Permit has been granted the Puget Sound Traction, Light & Power Company to construct a substation at 3773 14th avenue, Northeast, cost $3500.

WASHOUGAL, WASH.—Fire recently destroyed the plant of the Washougal Electric Light Company, located on the Washougal river, with loss estimated at approximately $15,000.

BUTTE CITY, CAL.—Great Western Canal Company will build power plant to develop 500,000 hp.

LOS ANGELES, CAL.—In connection with the proposed new irrigation system to be installed by the Palmdale Irrigation District in Antelope Valley, a number of pumping stations will be constructed, to be operated, it is understood, by electric power. The entire work, it is estimated, will cost approximately $550,000.

LOS ANGELES, CAL.—Pacific Electric Railway Company has been granted permission by the City Council to construct and operate a new line to connect its Ionia avenue-Hawthorne system with the line extending from Delta avenue to San Pedro, via Gardena.

MARTINEZ, CAL. — The Town Council has awarded a contract to M. P. Holmes, Berkeley, for the construction of a pumping station to be used in connection with the new sewerage system to be installed at a cost of $34,500. It is understood that the plant will be electrically operated.

OAKLAND, CAL.—San Francisco-Oakland Terminal Railway will expend $500,000 for purchasing street cars. Address A. W. Alberger of the Terminal company.

ONTARIO, CAL.—Ontario Power Company has been granted permission by the State Railroad Commission on its application to erect a large power plant in San Antonio Canyon. It is planned to utilize the water from San Antonio Creek. Arrangements are being made with the Southern California Edison Company whereby the latter company will take all energy generated which is not absorbed by the Ontario company during the first five years of the contract. The plant is estimated to cost about $65,000.

SAN DIEGO, CAL.—In connection with the construction of the proposed new marine brigade post on Dutch Flats by the Government, estimated to cost $1,500,000, arrangements have been completed for the installation of an electric lighting system. It is planned to commence active construction work about October 1.

SAN FRANCISCO, CAL.—A petition has been presented to the City Council by the Municipal League providing for the construction of a new hydroelectric power station in San Francisquita Canyon, to be known as Plant No. 2. It is held by the Municipal League that it is the city's patriotic duty to develop additional hydroelectric power to aid in the conservation of fuel oil.

ANCHORAGE, ALASKA. — Frank Bartholf, Billings, Mont., John Smith, Los Angeles, Cal., and associates have acquired the Gold Card mine in the Willow Creek district, and are planning for the installation of a hydroelectric power plant for operation.

PROPOSALS

ENGINE.—Sealed proposals will be received at Wessington Springs, S. Dak., October 5, on a new 150 hp. engine connected direct to 60-cycle, 3-phase, 2,300 volt generator, complete with exciter, 100-k. w. It is preferred that bids cover engine and generator completely installed. Address E. E. Dykeman, city auditor.

MACHINE TOOLS—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for the following motor-driven machine tools to be delivered at the Philadelphia (Pa.), navy yard: One drilling and tapping machine, all geared, 20-inch; one standard drill press, vertical, 25-inch; one grinder, disk, 30-inch; one grinder, wet, 20-inch; two pipe bending and cutting machines, 2-inch; two pipe threading and cutting machines, 2-inch; one pipe threading and cutting machine; one pump, triplex, pressure, all appearing on Schedule 1939.

TRANSFORMERS.—Until October 8, the Department of Public Service, Knickerbocker building, Los Angeles, Cal., will receive bids for a number of high voltage transformers for installation in the municipal power plant. James P. Vroman is secretary.

HEATING SYSTEM.—Until October 7, the Board of Supervisors, Los Angeles, Cal., will receive bids for the installation of a new low pressure heating system at the infirmary department of the Sylmar Sanitarium, at Sylmar. H. J. Lelande, county clerk.

INCORPORATIONS

FRAZEYSBURG, O.—Frazeysburg Telephone Company has been incorporated with a capital of $25,000. Address Max Frazier.

NIAGARA FALLS, N. Y.—P. J. Murphy Battery Corporation. Capital, $10,000. To manufacture batteries, etc. Incorporators: C. R. Evans, N. and P. J. Murphy, Niagara Falls.

NEW YORK, N. Y.—Acason Fleet, Inc. Capital, $10,000. To manufacture motors, electrical machinery and engines. Incorporators: C. W. and E. P. Decker, and H. A. Kiep, Jr., 339 Pearl street.

PRESTONSBURG, KY. — Eastern Kentucky Service Company. Nominal Capital, $5,000. To operate an electric system. Incorporators: W. S. Wells, O. H. Stumbo and C. P. Stephens.

BREWTON, ALA.—Blackshear Electric Corporation. Capital, $20,000. To operate an electric plant and system. Principal incorporators: E. M. Blackshear and Edward L. McMillan.

NEW YORK, N. Y.—Premier Incandescent Lamp Work. Capital, $30,000. To manufacture electric lamps, etc. Incorporators: W. L. Merck, C. Schickerling, and A. Emerson, 517 West 135th street.

NEW YORK, N. Y.—Penn Electric Smelting Corporation. Capital, $100,000. To engage in the electric smelting and refining of metals. Incorporators: C. Batchelor, W. W. Gephart, and D. P. Earle, 165 Broadway.

TRENTON, N. J.—Union Electric Company. Capital, $100,000. To operate a plant for the manufacture of electric porcelain. Incorporators: William I. Peacock, Thomas A., John D., and Duncan Mackenzie.

FOREIGN TRADE

[*Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.*]

ELECTRICAL APPARATUS (27,349).—A company in India wishes to purchase 500 200-volt direct current, three or four blade ceiling fans, 5,000 32-candlepower metallic filament, 5,000 lamp sockets, 6,000 switches, 5,000 fuseless ceiling rosettes, and 9,000 line fuse boxes, all of 220 volt; 30 miles No. 18 rubber covered copper wire, 20 miles No. 16 rubber-covered copper wire, 4 miles No. 7-20 rubber-covered copper cable, and one mile of flexible lamp cord. Terms, cash against shipping documents. Reference.

ELECTRICAL GOODS (27,242).—A company in Norway desires to purchase technical, electrical, steel and other goods. Quotations should be made f. o. b. New York. Payment will be made against documents. Correspondence may be in English. Reference.

ELECTRIC MOTORS (27,336).—A man in Canada wishes to purchase small electric motors, both direct and alternating current. Terms of payment to be arranged.

ELECTRICAL MACHINERY (27,334).—A man in Spain wishes to receive catalogs from American manufacturers of electrical and mechanical machinery and material of all kinds as well as material for lighting vessels. Correspondence should be in Spanish.

ELECTRICAL GOODS (27,393).—A firm in Brazil, maintaining a branch office in New York City, desires to purchase electrical and mechanical goods, rolling stock for electric tramways, engineering supplies, etc. Terms, cash by check on New York bank and, when obtainable, credit 120 days from date. References.

Trade Activities

Lidgerwood Manufacturing Completes Mine Installation—Litscher Lite Company Organized—Literature Distributed

The Link-Belt Company, through its Seattle office, has furnished all silent-chain drive required in the new annex to the grain elevator built by the Port Commission of Seattle. Similar chain drive was also supplied for 200 additional horsepower required in the plant of the Superior Portland Cement Company, at Concrete, Wash.

W. Montelius Price, Seattle, has sold to the Skinner & Eddy Corporation, shipbuilder, a C. & C. two-operator electric welding generator to be coupled to an Atlas gas engine, with controller devices, all to be mounted upon a Troy trailer, which may be used at any place in the yards or shops. This is a welder of 300 amperes capacity.

Morse Chain Company, Ithaca, N. Y., has just issued a handsome 24-page booklet devoted to "Front End Drives." In addition to giving the information its title indicates, relative to the driving of cam shafts, magnetos, lighting system generators, pumps, etc., a new picture of its greatly enlarged factory is shown. It is profusely illustrated with automobile engines, cars, data, tables and charts. The booklet will be of great interest to all manufacturers of engines, trucks and tractors and will be sent free to all upon request.

Litscher Lite Company, Grand Rapids, Mich., has been organized to manufacture electric light and power plants for farms and communities not served by public utility companies. It has been capitalized with $100,000 8 per cent preferred stock and 5000 shares of common stock with no par value. Having acquired large interests in the Michigan Wheel Company and the Monarch storage battery plant, the company will employ about 75 skilled mechanics in both of these places. The officers of the new company are as follows: President and treasurer, C. J. Litscher; vice-president, Fred N. Rowe; secretary and sales manager, W. Russell Patton.

Ingersoll-Rand Company, Seattle, recently sold a considerable amount of new equipment for installation in the plant of Pacific Coast Steel Company, at Youngstown, Seattle. Included in this were two 3-inch and two 8-inch centrifugal pumps, Cameron type. The first two are each direct-connected to a 40-hp., 220-volt motor, and operate against a head of 400 feet, handling 200 gallons per minute; the second two are direct connected to 100-hp., 2200-volt motors, working against a head of 175 feet and handling 1500 gallons per minute. These supply circulating water. Another installation consisted of an Ingersoll-Rand air compressor, 44-inch stroke, driven by a 200-hp. motor, to supply blast to oil-burning furnaces.

National Machinery & Wrecking Company, of Cleveland, Ohio, has been incorporated under the laws of Ohio and will hereafter be known as the National Power Machinery Company and will still be located at 1914 Scranton Road. From a small beginning many years ago it has become one of the largest and best dealers in used machinery, and plans are under way for increasing its already large line of business.

Lidgerwood Manufacturing Company has completed the installation at the Interstate-Callahan mine, near Wallace, Idaho, of a double-drum electric hoist, for operating to a depth of 2000 feet, capable of a balanced load of 8000 pounds. The hoisting drums are operated by a 250-hp., alternating-current motor, connected by reduction gears, running at 650 revolutions, and at a pressure of 440 volts. The motor is General Electric type. This business was handled by the Lidgerwood Company's office at Seattle, Wash.

Allis-Chalmers Manufacturing Company, through its Seattle branch, has sold electrical equipment to Siems-Carey-H. S. Kerbaugh Corporation, which has a contract for building an electric driven sawmill to be used in working up spruce timber. The equipment consists of a 1500-kw. turbo-generator and condenser, and motors amounting to 2500 hp. for operating mill machinery. Another order recently taken was for supplying a 750-kw. turbogenerator and a number of motors for the mill of Clear Lake Lumber Company, Clear Lake, Wash., which was partly destroyed by fire some time ago.

Boston-Economy Lamp Division, National Lamp Works of General Company, has been calling attention to its removal from Danvers, Mass., to 43 Hospital street, Providence, R. I. The industry of renewing tungsten lamps has grown steadily until in its present plant this division should be able to supply the demand for a reliable low-priced lamp for all installations where initial breakage is large and low cost of lamp installation is necessary. Just at this time also the need of a lamp to conserve fuel and therefore to take the place of the carbon lamp is apparent, for in using a renewed tungsten lamp, about three times the illumination is obtained at the same expenditure of fuel necessary to operate a carbon lamp. The change, then, from the carbon to renewed tungsten lamps is another step in helping win the war. The Boston-Economy Division, therefore, is now able to render material aid in supplying this demand. The former management is continued and the public will continue to receive the careful consideration it has always been extended.

The Home Appliance Company, with Stanley D. Howell as manager, has opened for business at 118 Spring street, Seattle. Its activities will be confined to the sale and installation of electrical appliances.

Morse Chain Company, Ithaca, N. Y., has issued 18-page, loose-leaf folders entitled "Morse Data Sheets" and are prepared to fit and bind in S. A. E. folders. In addition to showing the applications of the Morse rocker joint silent chain as used on many engines and cars, numerous illustrations and line cuts with data tables fully explain and give all the information the engineer requires for estimating, installing and operating front-end chain drives. The booklet will be of use and interest to automotive engineers and will be sent free to all inquirers.

Perfeclite Manufacturing Company, which now occupies new quarters for office and factory at 119 Main street, Seattle. Wash., has issued its catalog No. 3, in which is illustrated and described its Perfeclite illuminating fixtures of numerous types, each having a patented mirror reflector, to which is attached a number of individual mirrors, each placed at a different angle. This company claims to have successfully adapted the principle of mirror reflection to indirect fixtures. The Perfeclite fixture contains reflectors within the bowl. The result is a restful light, free from glare.

C. Kirk Hillman Company, electrical engineer, Seattle, Wash., sales representative of Wagner Electric Manufacturing Company, St. Louis, Electric Machinery Company, Minneapolis, Roth Brothers of Chicago, and Roller-Smith Company, Bethlehem, Pa., has been busy with various electrical installations and sales. Orders received from the Norway Pacific Construction & Dry Dock Company, Everett, Wash., comprised six 650-hp. motors, for driving air compressors, and two of 400 hp. each for driving two motor-generator sets; also a number of motors of smaller capacity, aggregating 800 hp., giving the concern a connected load of 5000 hp. The Hillman company also sold to the Gulowsen-Grei Engine Company, Seattle, about 1000-hp. in Wagner motors for operating shop tools and cranes in the latter's new plant in which oil engines for ships are being made. Sales were made of three Electric Machinery company synchronous motors of 250-hp. each, which were installed in the Skinner & Eddy shipyard plant for operating Sullivan twin-angle air compressors; and three similar motors of 350 hp. each and one of 650 hp. were sold and installed in shops of Seattle North Pacific Company, for operating air compressors.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

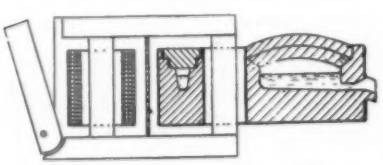
A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Extension Socket (1,274,202).—In the extension plug of Robert H. Ruth, the plug end is locked in the socket by means of a screw which also forms the central contact for engaging a lamp terminal. (Patent assigned to the Benjamin Electric Mfg. Co. of Chicago.)

Converting System (1,274,691).—In the vapor electric apparatus of David C. Davis (of Swissvale, Pa.) an auxiliary electrode absorbs energy from the vapor arc when the instantaneous voltage is high, and restores energy to the vapor arc when this voltage is low.

High Resistance Metal (1,274,250).—To produce a ductile and malleable alloy of high specific electrical resistance, Wilbur B. Driver (of East Orange, N. J.) uses over twenty percent of nickel and at least one percent of titanium. This amount of titanium is described as also greatly retarding oxidation at high temperatures.

Induction Furnace (1,275,206).—In electric induction furnaces, the load is usually regulated by cutting out parts of the windings of the induction coils. As a substitute, Oluf C. Boeckman (of Notodden, Norway) provides a magnetic flux path in parallel with the ordinary path of magnetic flux and regulates this auxiliary path. This may be done by moving extension members as shown in the illustration.



No. 1,275,206.—Induction Furnace.

Motor-Controller (1,274,684).—The controller of Allan J. Cline (of Chicago) uses electromagnets for automatically operating a series of resistance switches in one direction and in succession as the motor reaches different predetermined speeds, the magnets being responsive to the counter electromotive force developed by the motor.

Self-Propelled Vehicle (1,275,201).—Ralph H. Beach, of New York City (according to this patent, issued on an application filed in 1914), provides an electric motor for propelling the vehicle, and an engine-driven generator, as well as a battery for supplying the needed current. The generator is wound so that its voltage rapidly falls at a certain current strength, and the battery has a capacity intermediate that required for producing the desirable quick accelerations and that required for furnishing the complete driving force for the vehicle.

Ceiling Fixture (1,275,362).—Both the canopy and the rods holding the bowl are supported from the ceiling plate in the fixture patented by Frank A. Bakula and assigned to the Gross Chandelier Co., of St. Louis.

Disconnecting Switches.—Novel types of line disconnecting switches are shown in Patent 1,275,309 to James T. Hickey and John Schneider (both of New York City), and in Patents 1,275,918-9 to Edward M. Hewlett, the latter being assigned to the General Electric Co.

Cleaning Metal Articles (1,274,186.)—Silver, gold and the like are cleaned by electrolytic action through their contact with zinc in a bath consisting of a half cup of salt, one cup of vinegar, and a gallon of water. (Patent assigned by Chas. B. Morey and Chas. J. Huber to the Larkin Co. of Buffalo, N. Y.)

Cable-Sheath Remover (1,275,225).—For removing the casings of lead-covered cables, Henry C. Cleve (of Washington, D. C.) has devised a tool having a single cutting wheel. It is arranged somewhat after the manner of a pipe cutter, but the clamp which presses the cable against the cutter can also be swung into a position oblique to the axis of the cable.

Automatic Guide Lights for Vessels (1,274,265).—A system of selectively controlling the illumination of lights on distant floats is described in this patent to John Hays Hammond, Jr., of Gloucester, Mass. The method apparently is somewhat allied to that employed by Mr. Miessner in his famous "electric dog" stunt. Patent No. 1,274,264 to the same inventor describes one of his earlier methods of selective electric wave signaling.

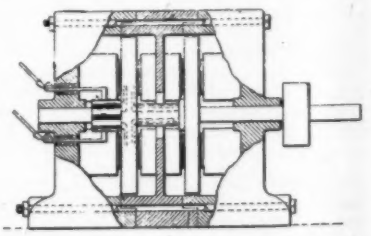
Producing Flashes (1,274,009).—To produce flashes by volatilizing fusible wires, Jules Courtier and Pierre Courtier (both of Paris, France) mount the fusible wires by means of eyelets on a disc of insulating material. A commutating arrangement is used for conveying the current, and a special device is provided for limiting the number of wires volatilized at each operation.

Armored Conduit (1,275,279).—A spiral metal winding with overlapped and interlocking portions permitting a bending of the conduit is shown in this patent, assigned by George A. Lutz, of Cranford, N. J., to the American Circular Loom Co.

Illuminated Pencil (1,274,002).—After dark, Christian Edmundson (of Tientsin, China) slips a clip on his pen or pencil. This clip carries a small reflector and two miniature lamps, the latter being connected to a portable battery.

Extracting Static Electricity (1,275,585).—To remove static charges, John H. Morgan and Charles W. Huntley (both of Holyoke, Mass.) use positive and negative plates immersed in a dilute sulphuric acid, and connect these plates respectively to a ground and to a collector placed within the static field.

Sectional Dynamos (1,275,665).—To make generators of different capacities, Herman W. Eichbaum (of Venice, Cal.) mounts armature and field-coil units in independent case sections and provides the units with terminals which contact from one to another when any desired number of these sections are assembled.



No. 1,275,665.—Sectional Dynamo.

Semi-Luminous Lamps (1,275,871 to 1,275,873, and 1,275,890).—Various arrangements for mounting phosphorescent material close to lamp bulbs, or even inside the lamp bulbs, are shown in these patents, assigned by various inventors to the Flannery Bolt Co., of Pittsburgh. For example, the first numbered patent shows a glass globe inclosing a cage which carries phosphorescent material and which in turn incloses a lamp bulb.

Etching Steel Electrically (1,275,048).—For this purpose, William S. Eaton (of Sag Harbor, N. Y.) submerges the plate in a chloride solution so weak as to have little or no corrosive action on the plate, and uses the latter as the anode of an electric couple. Then he applies a current of a voltage insufficient for decomposing the electrolyte, but sufficiently high to liberate chlorine from the liquid, thus causing the etching to be done by chlorine while in a nascent state.

Men in Service

F. G. Simpson Joins Engineering Division of Naval Reserve—Military Training Classes Held at Goodyear Plant

LIEUT. ROBERT MONTGOMERY, of the 84th division, formerly manager of the commercial department of Louisville Gas & Electric Company, Louisville, Ky., has arrived safely in France.

R. C. COFFY, manager of the Sapulpa (Okla.), Electric Company, has been appointed chairman of the Publicity Committee of Creek County, for the Fourth Liberty Loan campaign.

SAMUEL W. GREENLAND, general manager of the Ft. Wayne & Northern Indiana Traction Company, Ft. Wayne, Ind., was recently commissioned a major in the chemical branch of the U. S. Army. He will continue the supervision of power station construction at a Baltimore gas making plant, in which he has been engaged since last April.

H. LEROY BAER, a well known and progressive contractor-dealer of Van Wert, Ohio, is now serving with the colors. Before leaving for camp, Mr. Baer mailed a very unique announcement card to the trade, calling attention to the fact that he had been called for service in the United States Army and that he had discontinued business until his return.

JOHN T. MOUNTAIN, assistant to the chief operating engineer of the Commonwealth Edison Company, Chicago, has received a commission as captain. He now is located at Camp Humpheys, Va., where he will undergo a three months' training course for immediate service overseas in the combatant branch of the Engineering Corps. Captain Mountain has had considerable experience in military matters, having attended the Officers' Camp at Fort Sheridan in 1915, and was also a member of the Edison party that attended the training cruise for civilians on the Atlantic in 1916. He was recently a lieutenant in the Illinois Volunteer Training Corps.

ROCHESTER RAILWAY & LIGHT COMPANY, Rochester, N. Y., continues to add names to its already large roll of honor, having recently added the following names of employes who have left to enter various branches of the service: Army—Samuel Butera, Frank Cilaca, Samuel J. Cohn, Ellis Cornell, Norman Davidson, James De John, Archie Gardiner, Frank Gunther, Leo F. Klein, Angus Mackay, Thomas Melfi, Tony Miceo, Tony Nick, John O'Keefe, Frank Pelucosie, S. Presulto, William Quetchenbach, Roy J. Rodell, R. Russo, Charles Simon, William Spellman, James Sweetman and John Ulrich; Navy—David Alloway, Andrew Brostrom, Patrick Byrne, James Casey, James Clifford, Brayton Daniels, Frank Kennedy, Samuel S. Amdursky, Anthony Haldrick, Oswald Kirchner, John Muller, H. Shults, Harold Swanton, Charles Tully, McKinely York, Leonard J. Hall, Y. M. C. A. service, and Roy Darron, U. S. Naval Academy.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

L. A. GAINS, formerly connected with the engineering department of the Sierra & San Francisco Power Company, has entered the civil service radio work of the Government at Mare Island, Cal.

GOODYEAR TIRE & RUBBER COMPANY CONDUCTS MILITARY TRAINING CLASSES.

Military training classes at the Goodyear Tire & Rubber Company, Akron, Ohio, which have been in progress ever since our country's entry into the war, have now been extended to include all inspectors and foremen, adding 1,300 men to the 700 that had already been taking advantage of the opportunity to acquire a comprehensive acquaintance with military tactics and practice. This new feature is designed as a part of the regular duties of all inspectors and foremen, during their regular working hours, on Wednesdays and Fridays of each week, and applies to all alike, exemption being made only in case of physical disability, certified by the company's physicians.

Military drill has been popular at this plant, as is amply evidenced by the large number of employes that have voluntarily entered the various drill classes. Many former employes, who have received rapid promotions from the ranks as non-commissioned officers or have been later recommended for commissions in the various officers' training camps, have written that in large part they owed their success to the previous experience they had received in the Goodyear drill classes. It is the belief of the Goodyear officials that military training teaches accuracy, promptness, efficiency and discipline and gives an all-around training to the body. And in the hope that these benefits might be shared in by its workmen, the company has placed at the doors of its workers opportunities to acquire them.

LEE M. REELY, who has been welfare superintendent of the United Railways & Electric Company, Baltimore, Md., has joined the United States Naval Reserve Force.

EDWARD BRIGGS, formerly in the rate department of H. M. Byllesby & Company, Chicago, and who recently went to Camp Grant, has been promoted to regimental sergeant-major.

FRED H. FOWLER, formerly district engineer of the Forest Service, with headquarters at San Francisco, Cal., has left for Washington, D. C., where he has accepted a commission as captain in the Engineers' Reserve Officers' Corps, detailed for special investigation.

JOSEPH MALONEY, WALTER BETZ and LEO SAGE, all of the accounting department of H. M. Byllesby & Company, Chicago office, have joined the Student Army Training Corps which becomes part of the U. S. regular army October 1. The men have all left for Notre Dame University (Indiana), where they will receive special training. This makes forty men from the Chicago office now in either Army or Navy.

FREDERICK G. SIMPSON, vice-president and general manager of the Kilbourne & Clark Manufacturing Company, Seattle, Wash., maker of wireless apparatus, has been called into active service in the navy and assigned to engineering duties, bearing the rank of lieutenant commander, U. S. Naval Reserve. During the past two years Mr. Simpson has devoted much of his time to wireless inventions and improvements, for which he has become widely known. Through the combined efforts of President A. C. Kilbourne and Mr. Simpson, a staff of executive and technical experts of such efficiency has been established that Mr. Simpson has been able for the past five months to aid the Government at Washington.

COMMONWEALTH EDISON COMPANY has changed two more blue stars on its service flag of 1,242 stars to gold, bringing the total to seven. These are in memory of two Edison men, Sam Melmichuk, of the building maintenance department, and Rick W. Schultz, of the construction department, who died upon the battle field in France. Corporal Melmichuk was killed August 1, while in action with the 128th Infantry. He left the company on September 22, 1917, going to Camp Grant, Ill., where he was assigned to Company E, 344th Infantry. Later he went to Camp MacArthur, Waco, Tex., with the 52d Division, and from there directly to France. Mr. Schultz, according to word received, was killed in action on July 15. He left the company on November 9, 1917, going to Camp Greene, Charlotte, N. C., where he was assigned to Headquarters Company, 30th Infantry, and from there was sent directly to France. He was with a Signal Corps detachment at the time of his death.

Personal

C. A. Stanley Resigns—Frank B. Steele Joins Charles M. Kelso Company—W. M. Willett Promoted—Other Changes

B. W. COWPERTHWAIT, general manager of the Northern States Power Company, Faribault, Minn., division, is vice-chairman of the Rice County Liberty Loan Committee for the fourth drive.

WARREN T. BULKLEY, former plant supervisor of the Danbury & Reheal Gas & Electric Light Company, Danbury, Conn., has been promoted to the position of general superintendent.

U. S. PATILLO has been appointed electrical engineer and engineer of overhead construction of the St. Johns Electric Company of St. Augustine, Fla., succeeding W. M. Bidlake and Henry Taylor.

A. J. BARNES, director of publicity of the Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., has assumed additional responsibility in his connection with the company, having also been appointed its export manager.

G. HAROLD DAVIS, former chief bookkeeper of the Danbury & Bethel Gas & Electric Company, has been appointed secretary of the company, succeeding H. A. Louwein, who is now connected with the War Industries Board in Washington.

M. S. ORRICK has resigned as assistant sales manager of the Western Electric Company at San Francisco to engage in the wholesale paint business at Oakland, Cal. He has been succeeded by Leslie J. Brown, formerly Sunbeam lamp sales representative with the Western Electric Company.

W. G. MEROWIT, Buffalo, N. Y., has been appointed agent for the Roller-Smith Company, 233 Broadway, New York, with headquarters at 716 Ellicott Square. Mr. Merowit will handle the Roller-Smith Company's lines of instruments, meters and circuit breakers in the western part of the State of New York.

E. J. DUNN, Harvard, Ill., who has been engaged in the electrical business under the name of the Harvard Engineering Company, has accepted a position as superintendent of the East Montana Light & Power Company, with headquarters at Beach, N. Dak. He will have supervision of plants in four cities and also a telephone exchange.
T. A.

CHARLES A. STANLEY, for the past five years in charge of the commercial engineering department of the Kansas Gas & Electric Company, has been made general superintendent of the Arkansas Valley Interurban Railway of Wichita, Kans. Mr. Stanley is a graduate of the General Electric expert course, and spent ten years in the General Electric shops in charge of railway testing and design. Since that time he has served as a railway appraisal engineer and has been connected with several electric light companies in various capacities.

FRANK B. STEELE, power engineer of the Dayton Power & Light Company, Dayton, Ohio, has severed his connection with that company to become associated with the Charles M. Kelso Company, industrial engineer and contractor, 1065 Reibold building, Dayton. Mr. Steele was graduated from the Virginia Military Institute in the electrical department in 1905 and later from the George Washington University of Washington, D. C., with the degree of Electrical Engineer. He spent two years as an engineering apprentice with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., and after completing this course, became construction engineer for the company, making installations of power plants and substations particularly in property of the U. S. Government. He was coal operator in West Virginia for three years prior to his coming to Dayton and

Frank B. Steele.

during the past five and one-half years has been connected with the Dayton Power & Light Company as power engineer. He is a member of the American Institute of Electrical Engineers and also the National Electric Light Association. He has been active in association affairs, having been a member of the New Business Committee of the Ohio Electric Light Association in 1916 and 1917 and chairman of the Power and Heating Section in 1918. Charles M. Kelso Company started business a number of years ago in a modest way and has been successful in building up a very large consulting and contracting business, having completed a number of large contracts in the last two years, numbering among which are the partial installation of the water system of the Oakwood Water & Light Company; furnishing and installing a complete duplicate water works system and elevated water towers for the Wilbur Wright Aviation Field; sewerage system for the McCook Aviation Field; installing a complete water system for the Pennsylvania Railroad Company at its new junction at Frankfort, Ind.; changing the mills from steam to electric drive in the Hooven & Allison plant at Xenia, Ohio, and making a complete change in the steam heating system and water system and the electric pumping equipment and other necessary changes recently made in the Dayton Arcade Company.

MERCER P. MOSELEY, of New York, has been appointed chief conservation fuel officer for the State of New York by State Fuel Administrator Cooke.

J. F. OWENS, vice-president and general manager of the Oklahoma Gas & Electric Company, has been elected director of the Oklahoma City Chamber of Commerce.

JAMES H. GILHULY, representative of the Youngstown Sheet & Tube Company, San Francisco, Cal., was recently elected vice-president of the Electric Agencies Company, special representative of the Youngstown company on the Pacific Coast.

WILLIAM M. WILLETT, formerly of Yorkville, and assistant superintendent of the Western Gas & Electric Company of Aurora, Ill., has been advanced to the position of superintendent, filling the vacancy made by the removal of Carroll Miller to Pittsburgh. Mr. Willett has served the company most efficiently for some twenty years, and his promotion is a mark of merit for a business man who thoroughly understands his life's work.

Obituary.

EDWARD CORRIGAN, Baltimore, Md., general superintendent of traffic of the Chesapeake & Potomac Telephone Company, died on September 19, at his home, aged 50 years.

FRANK CAZENOVE JONES, founder and one time president of the Manhattan Rubber Company, died recently at his home at 830 Park avenue at the age of 61 years. He was born in Washington and was graduated from Georgetown University and later from the Stevens Institute of Technology as a civil engineer. At the time of his death he was president of the Cerea Company, a director of the New York Lubricating Oil Company and chairman of the board of directors of the Okonite Company. He was a member of the Engineers and New York Athletic clubs. Mr. Jones was a grandson of Commodore Jacob Jones, U. S. N., who was captured with the frigate Philadelphia in the war with Algiers, held a prisoner there for twenty months and afterward commanded the Wasp, which defeated the British sloop Frolic in the War of 1812.

After the War, What ?

IV.

WIN THE WAR

The first thought of our Government is for war work. This is so big that for the moment it must be almost the only thought.

Yet it would be the national shame of the ages if we were not to be able, while winning the war, with all the present increase of industrial energy to insure continuing prosperity, to pay the war debts after the war, as well as bear the growing financial burden during the war.

BUT PREPARE FOR PEACE

The writer does not pretend to know the mind of high Government officials. Necessarily that mind (or those minds) must change rapidly as conditions and events change.

However, we must remember that many Government officials and many of their important subordinates are practical business men taken out of their own businesses and facing the gigantic task of conducting the greatest war of all history.

It is too much to expect of these men that they can devote much thought to anything else; they must concentrate on this task to the exclusion of everything else.

This task is so huge and absorbing that many a man in Government work who has formerly been at the head of an important business concern has said that his former activities seem petty, insignificant and uninteresting as compared with his present task.

This puts it distinctly up to those who must remain in business, to not only take care of business for the present but to see that business emerges strong and virile,—to see that business receives no wounds that can be avoided, to see that patriotism as applied to business is intelligent and constructive.

Successful business is the basis of national ability to conduct war and make a successful peace.

By HOWARD W. DICKINSON,
New York

DO you realize that we are as far behind in our preparations for peace as we were in our previous unreadiness for war? Read these few pointed remarks and think them over.

INTERNATIONAL TRADE PRESS, Inc.
C. A. Tupper, President . CHICAGO

Financial News

Organization Plans of Company to Finance All Public Utilities.

Announcement has been made of plans for the organization of the Essential Industries Finance Corporation, which will aid in the financing of public utility companies and industries necessary for the prosecution of the war. The company will be incorporated under the laws of New York and will begin business with an initial capital of $3,000,000, consisting of $1,000,000 of stock, $1,800,000 of 10-year debentures, and $200,000 surplus. Of the $1,000,000 of stock, $200,000 will consist of class A shares, which will be limited in respect to dividend returns, and $800,000 of class B shares, with no restrictions. The A stock will be sold at par, while the B stock will be sold at $125 a share, the additional $25 a share providing the $200,000 surplus.

Eugene V. R. Thayer, president of the Chase National Bank, will be president of the new corporation, and Frederick Strauss, of J. & W. Seligman & Company, and Gerhard M. Dahl, vice-president of the Chase National Bank, will be vice-presidents.

It is intended that the Essential Industries Finance Corporation, as loans are made by it to public utility and other companies, shall avail itself of the provisions of the war finance act by borrowing money from the War Finance Corporation, rehypothecating the notes and securities received by it in respect to advances made. It is planned that the capital of the Essential Industries Finance Corporation shall be increased from time to time as the business of the company expands. Its capital will probably reach $20,000,000 ultimately, on which basis it will be able to borrow about $50,000,000 from the War Finance Corporation, thus making available $70,000,000 for loans to public utility and other companies requiring financial asistance.

The interests connected with the new company that will be represented on the board of directors are the following: Chase Securities Company, Guaranty Trust Company, Central Union Trust Company, First National Bank, J. P. Morgan & Company, J. & W. Seligman & Company, E. W. Clark & Company (Philadelphia), General Electric Company, Westinghouse Electric & Manufacturing Company, and the United Gas Improvement Company of Philadelphia.

Publications of Current Interest.

For some time the Guaranty Trust Company of New York has been issuing from time to time a series of booklets and pamphlets in convenient form dealing in a concise and reliable way with general business conditions and matters of financial interest. Some of these publications, available on request, are: The Awakening of a Great Nation, Facing Our War Finance Problem,Banking Institutions to Finance Our Future Abroad, The Promise of Our Vision, Cost and Gain of Four Years' War, Factors That Cause High Prices, Commercial Credits Through Acceptances.

The Guaranty Trust Company of New York has also issued a series of papers dealing with financial and economic conditions in other countries, with special reference to the preparations being made for holding and increasing their foreign trade when the war is finished.

Phone Companies' Net in May Less.

A summary of revenue and expenses of 61 of the largest telephone companies for May, made public today by the Interstate Commerce Commission, shows a decrease in net operating income of $353,740, or 5.3 per cent, as compared with May, 1917. In the same month there was an increase in total operating revenues of $1,453,613, or 5.4 per cent, over May of last year. A summary for April recently showed a substantial increase in net operating income over the same month last year. For the five months ended May 30 net operating income decreased $1,586,520, or 4.6 per cent, as compared with the same period in 1917.

Cities Service Bonds Oversold.

H. L. Doherty & Company and Montgomery & Company, managers of the syndicate which recently offered to investors $6,000,000 Cities Service Company series B 7 per cent convertible debentures at 102½ and interest, announced recently that the syndicate has been closed, the offering having been oversubscribed.

Malone Light & Power Increases Capital Stock.

Malone Light & Power Company has filed notice of increase in its capital from $194,000 to $300,000. The company operates four hydroelectric power plants and one steam generator station, furnishing service at Malone, North, South and West Bangor, Whippleville and surrounding territory. It is understood that expansion is contemplated.

Indiana Company Issues Preferred Stock to Retire Liabilities.

The Indiana Public Service Commission has denied the petition of the Indiana Power & Water Company to change $150,000 short time notes into preferred stock. The right to issue $350,000 preferred stock to retire certain liabilities was granted. Some time ago the commission provided for the amortization of $150,000 used by the company in buying properties at Dugger, Petersburg and Vincennes and it was this $150,000 that the company wished to convert from short-time notes into permanent securities. To have permitted such a conversion, the Commission held, would have amounted to an annulment of the amortization order. The liabilities to be retired by the $350,000 stock issue were incurred principally for the plant which the company has erected at Edwardsport.

Dividends.

The board of directors of the United Light & Railways Company has declared a dividend of 1½ per cent on the first preferred stock, and a dividend of 1 per cent on the common stock, payable, out of the surplus earnings, on October 1 to stockholders of record September 16.

Western Electric Company has declared a quarterly dividend of $2.50 per share on common stock, and 1¾ per cent on the preferred stock, both payable September 30 to stock of record September 21.

Kansas Gas & Electric Company has declared a dividend of 1¾ per cent on preferred stock, payable October 1 to stock of record September 21.

Virginia Railway & Power Company has declared a quarterly dividend of $2.50, payable October 21 to stock of record September 30.

Massachusetts Lighting Company has declared a quarterly dividend of $1.50 on preferred stock, payable October 15 to stock of record September 25.

Illinois Traction System has declared a quarterly dividend of 1½ per cent on preferred stock, payable October 1 to stock of record September 16.

Utah Power & Light Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable October 1 to stock of record September 14.

West Kootenay Power & Light Company has declared a quarterly dividend of 2 per cent; also a quarterly dividend of 1¾ per cent on preferred stock, both payable October 1 to stock of record September 20.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Sept. 17.	Bid Sept. 24.
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	68	..
American Gas & Electric of New York, common	10+extra	80	79
American Gas & Electric of New York, preferred	6	37	39
American Light & Traction of New York, common	..	179	177
American Light & Traction of New York, preferred	6	91	91
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	66	68
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	33	33
American Telephone & Telegraph of New York	..	98	97
American Water Works & Elec. of New York, common	..	4½	4½
American Water Works & Elec. of New York, particip	7	11	11
American Water Works & Elec. of New York, first preferred	..	57	57
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	21	20
Cities Service of New York, common	+extra	208	208
Cities Service of New York, preferred	6	71¾	71¾
Commonwealth Edison of Chicago	8	101	101
Comm. Power, Railway & Light of Jackson, common	..	16	18
Comm. Power, Railway & Light of Jackson, preferred	6	34	36
Federal Light & Traction of New York, common	..	7	7¼
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	15	16
Middle West Utilities of Chicago, preferred	6	35	38
Northern States Power of Chicago, common	..	43	43
Northern States Power of Chicago, preferred	ex.div.7	81	81
Pacific Gas & Electric of San Francisco, common	..	32¾	33
Pacific Gas & Electric of San Francisco, preferred	6	76	77½
Public Service of Northern Illinois, Chicago, common	7	75	75
Public Service of Northern Illinois, Chicago, preferred	6	78	80
Republic Railway & Light of Youngstown, common	4	18½	15
Republic Railway & Light of Youngstown, preferred	6	56	55
Standard Gas & Electric of Chicago, common	..	4½	4½
Standard Gas & Electric of Chicago, preferred	6	21	21
Tennessee Railway, Light & Power of Chattanooga, common	..	2	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	12½	12
United Light & Railways of Grand Rapids, common	4	29	29
United Light & Railways of Grand Rapids, preferred	6	58	59
Western Power of San Francisco, common	..	11	11
Western Power of San Francisco, preferred	6	48	48
Western Union Telegraph of New York	extra	83	82
Industrials—			
Electric Storage of Philadelphia, common	4	52	49½
General Electric of Schenectady	8	147	147
Westinghouse Electric & Mfg. of Pittsburgh, common	7	43¼	43
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	58	58